USDA United States Department of Agriculture

Natural Resources Conservation Service

In cooperation with the Research Division of the College of Agricultural and Life Sciences, University of Wisconsin

Soil Survey of Jackson County, Wisconsin

How to Use This Soil Survey

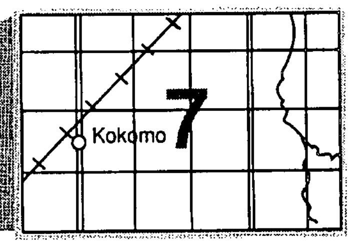
General Soil Map

The general soil map, which is the color map preceding the detailed soil maps, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

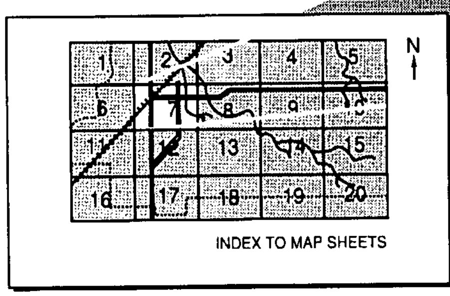
To find information about your area of interest, locate that area on the map, identify the name of the map unit in the area on the color-coded map legend, then refer to the section **General Soil Map Units** for a general description of the soils in your area.

Detailed Soil Maps

The detailed soil maps follow the general soil map. These maps can be useful in planning the use and management of small areas.



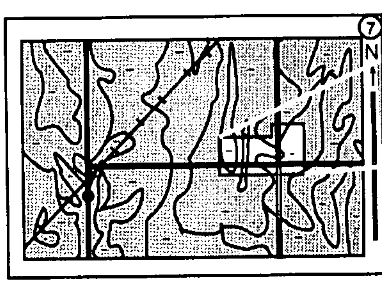
MAP SHEET



INDEX TO MAP SHEETS

To find information about your area of interest, locate that area on the **Index to Map Sheets**, which precedes the soil maps. Note the number of the map sheet and turn to that sheet.

Locate your area of interest on the map sheet. Note the map units symbols that are in that area. Turn to the **Index to Map Units** (see Contents), which lists the map units by symbol and name and shows the page where each map unit is described.



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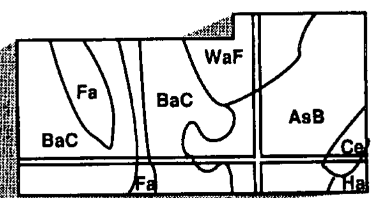

AREA OF INTEREST

NOTE: Map unit symbols in a soil survey may consist only of numbers or letters, or they may be a combination of numbers and letters.

The **Contents** shows which table has data on a specific land use for each detailed soil map unit. Also see the **Contents** for sections of this publication that may address your specific needs.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (formerly the Soil Conservation Service) has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1991. Soil names and descriptions were approved in 1992. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1992. This survey was made cooperatively by the Natural Resources Conservation Service and the Research Division of the College of Agricultural and Life Sciences, University of Wisconsin. It is part of the technical assistance furnished to the Jackson County Land Conservation Committee, which helped to finance the fieldwork.

Cover: Grassed waterways and contour stripcropping in an area of gently sloping farmland near Melrose in Jackson County.

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Issued 2001

Foreword

This soil survey contains information that can be used in land-planning programs in Jackson County. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. The information in this report is intended to identify soil properties that are used in making various land use or land treatment decisions. Statements made in this report are intended to help the land users identify and reduce the effects of soil limitations that affect various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are only moderately deep to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

Patricia S. Leavenworth
State Conservationist
Natural Resources Conservation Service

Soil Survey of Jackson County, Wisconsin

By John E. Langton and Duane T. Simonson, Natural Resources Conservation Service

Fieldwork by Roger A. Dahl, Dale E. Jakel, Richard M. Johannes, John E. Langton, Howard E. Lorenz, Theron A. Meyer III, and Duane T. Simonson, Natural Resources Conservation Service

United States Department of Agriculture, Natural Resources Conservation Service, in cooperation with
the Research Division of the College of Agricultural and Life Sciences, University of Wisconsin

Jackson County is in west-central Wisconsin (fig. 1). At the widest points, it is about 36 miles from north to south and 42 miles from east to west. It has a total land area of about 639,879 acres, or about 1,000 square miles. In 1991, the population of Jackson County was estimated at 16,661 (Wisconsin Department of Administration). Black River Falls, along the Black River in the west-central part of the county, is the county seat.

Jackson County is about equally divided by the Black River. Approximately 41 percent of the area west of the river is farmland, and about 97 percent of the area east of the river is woodland. Dairying is the leading enterprise in the county (Wisconsin Department of Agriculture, Trade, and Consumer Protection/USDA, 1990). Service and industrial developments are expanding. The county provides opportunities for a wide variety of recreational activities.

This soil survey updates the survey of Jackson County made in about 1918 by the U.S. Department of Agriculture, Bureau of Soils, and the Wisconsin Geological and Natural History Survey. Each agency published a separate report (USDA, 1922; Wisconsin Geological and Natural History Survey, 1923). The present survey provides additional information and has larger maps, which show the soils in greater detail.

General Nature of the County

This section provides information regarding some of the physical and cultural characteristics of the county. It describes history and development; climate; physiography, relief, and drainage; water supply; and transportation facilities and industry.

History and Development

Indians lived in the area that is now Jackson County for many years before the arrival of French explorers, missionaries, and fur traders. In about 1795, a fur trading post was located near the falls of the Black River. As early as 1819, some logging was done along the Black River. This activity was interrupted, however, by hostilities over logging rights on Indian lands.

In 1837, the land that included the survey area was ceded to the United States by the Winnebago Indians. In 1839, Robert Douglas established the first farm in the Melrose area, and at about the same time Jacob Spaulding built the first permanent sawmill near the falls of the Black River. During the peak lumbering period, almost 5 billion board feet was cut and tallied from the pineries of the area. A State road from Prairie du Chien to Hudson, by way of Black River Falls and Eau Claire, hastened the settlement

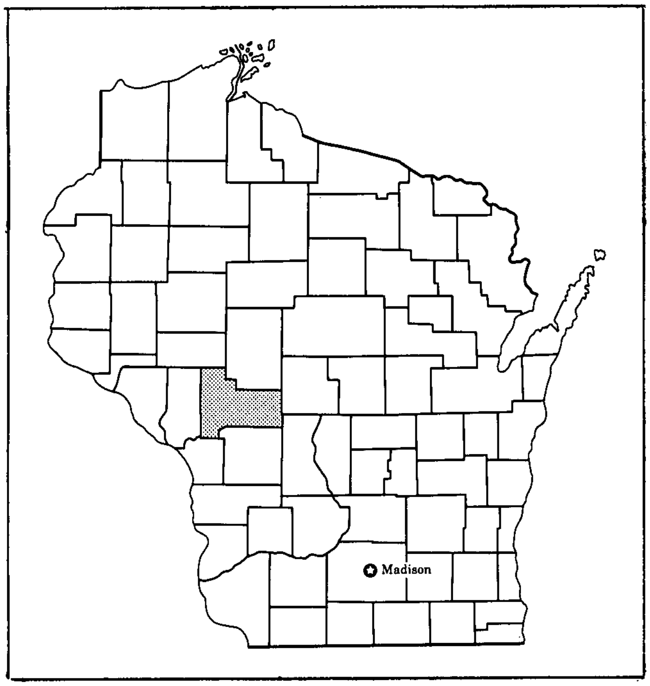

Figure 1.—Location of Jackson County in Wisconsin.

of west-central Wisconsin. In 1854, Jackson County was established as a separate jurisdiction. Originally, the county included areas now known as Trempealeau County, Clark County, and parts of Buffalo County. Six boundary changes between 1854 and 1883 established the present boundaries of Jackson County (American Bicentennial Project, 1976).

Development in Jackson County was hastened by railroad construction. The West Wisconsin Railroad was completed in 1868. Later it was sold to the Chicago and North Western Railroad and now passes through the county en route from Chicago to St. Paul. The Green Bay and Western Railroad was completed in 1874. It passes from east to west through the county, en route from Green Bay to Winona, Minnesota. The Green Bay and Western joins the Chicago and North Western at Merrillan. Jackson County has a good network of county, State, and Federal roads. Interstate 94 passes through the county from northwest to southeast.

The eastern part of the county consists of nearly level and gently sloping land with scattered, steep and very steep mounds of sandstone. Some of these mounds are as much as 300 feet high, and some have cores of low-grade iron ore. Periodically, mining of the ore has been a marginal operation. This mining first occurred in the 1850's, later in the 1880's, and most recently in the 1970's (American Bicentennial Project, 1976).

The earliest farmers raised crops primarily for their own needs. As more land was cleared, wheat became the main crop until the depletion of soil fertility and an infestation of insects caused widespread crop failures. Many farmers turned to raising large starchy potatoes for a starch factory in Black River Falls. After 1920, dairy farming increased and hay, small grain, and corn became important crops. At present, about 50 percent of the farm income in the county comes from dairy products. The remaining farm income is derived from the sale of meat animals, poultry, eggs, field crops, vegetables, fruits, sphagnum moss, and forest products (Wisconsin Department of Agriculture, Trade, and Consumer Protection/USDA, 1990). Jackson County is the third leading producer of cranberries in Wisconsin. Farming is still an important source of revenue, but the importance of recreation, retailing, and the service industry is increasing.

Population trends in Jackson County are generally similar to those of the State as a whole. That is, rural areas have lost population but the population in urban areas has increased. In Jackson County, however, the losses in rural areas are greater and the gains in urban areas are lower than those typical for the State. Most of the population in Jackson County is west of the Black River.

Climate

Winters in Jackson County are cold, and summers are short and warm, with several hot and humid periods. Precipitation is fairly well distributed throughout the year, reaching a slight peak in summer. Snow covers the ground during much of the period from late fall through early spring.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Blair in the period 1951 to 1981. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter, the average temperature is 16 degrees F and the average daily minimum temperature is 6 degrees. The lowest temperature during the period of record, which occurred on January 30, 1951, is -43 degrees. In summer, the average temperature is 69 degrees and the average daily maximum temperature is 81 degrees. The highest temperature during the period of record, which occurred on August 3, 1964, is 104 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (50 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The growing season averages 128 days at the weather station in Blair, near the western border of Jackson County. It varies greatly where there are significant differences in relief. Generally, it is shorter in low depressions and longer on high ridgetops. Also, the number of growing degree days varies significantly throughout the county. It is about 4,333 at Blair, which has climate conditions similar to those in the western part of Jackson County, and about 2,175 at Mather, which has climate conditions similar to those in the eastern part of the county.

The total annual precipitation is about 33 inches. Of this, 24 inches, or about 73 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 13 inches. The heaviest 1-day rainfall during the period of record was 6.08 inches on August 23, 1975. Thunderstorms occur on about 42 days each year.

The average seasonal snowfall is about 44 inches. The greatest snow depth at any one time during the period of record was 29 inches. On the average, 61 days of the year have at least 1 inch of snow on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 61 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 65 percent of the time possible in summer and 45 percent in winter. The prevailing wind is from the south. Average windspeed is highest, 10 miles per hour, in spring.

Physiography, Relief, and Drainage

Robert N. Cheetham, geologist, Natural Resources Conservation Service, helped prepare this section.

Jackson County is in two physiographic regions—the Western Upland, which makes up about 40 percent of the county, and the Central Plain, which makes up about 60 percent. The Western Upland, west of the Black River, is a dissected plateau with relief of several hundred feet. It is composed of Paleozoic marine sandstones. Much of the friable sandstone has been reduced by mass wastage and forms long slopes mantled by windblown silts and sands. A few high ridges near the Trempealeau County line are capped by remnants of a more resistant calcitic dolomite at elevations more than 1,300 feet above mean sea level.

The Central Plain, which extends from the eastern county boundary to a few miles west of the Black River, is a much eroded landscape of Upper Cambrian sandstone. The area is mostly level and swampy with occasional sandstone mounds and a few knobs of Precambrian rock ranging from a few to several hundred feet above the plain. At Black River Falls the valley bottom is a Precambrian granite; a fall line marks the transition from a resistant granite to an erodible sandstone.

The total relief in Jackson County is about 790 feet. The elevation is highest, about 1,400 feet, at Saddle Mound, just north of Highway 54 in the east-central part of the county. It is lowest, about 610 feet, at the point where the Black River leaves the county. About 64 percent of the county is drained by the Black River and its tributaries. The Black River flows toward the southwest through the middle of the county. It enters Jackson County (Lake Arbutus) at an elevation of 833 feet and leaves the county at an elevation of 610 feet at the Trempealeau County line. The Black River joins the Mississippi River about 20 miles downstream from the Jackson County line. About 25 percent of Jackson County, most of the northwestern part, is within the Trempealeau River Basin. The Trempealeau River drains southwest to the Mississippi River. About 6 percent of the county, the northwestern part bordering Eau Claire County, is drained by the Buffalo River. The Buffalo River flows west and southwest to join the Mississippi River. About 5 percent of the county, the southeastern part, is within the Lemonweir River Basin. The Lemonweir River drains southeast to the Wisconsin River.

Water Supply

Robert N. Cheetham, geologist, Natural Resources Conservation Service, helped prepare this section.

Jackson County has about 8,430 acres of surface water. Water quality is generally fair. In the eastern part of the county, the Black River and other surface water areas are darkly colored by organic substances from bogs and swamps. The water is soft, with generally less than 250 milligrams of dissolved solids per liter.

Jackson County has a large supply of good quality ground water. The Cambrian sandstones are the principal source. Also, less extensive areas of sand and gravel along the Black River and in the Central Sand Plain along the eastern boundary of the county

are very good sources of ground water. The Precambrian bedrock, which underlies the sandstone and the sand and gravel, is mostly granitic and metamorphic rocks. It is not an important water source.

Wells in Jackson County have been monitored for water quality by the U.S. Geological Survey (Kammerer, 1984). Most of the ground water in the sandstone and sand and gravel aquifers has a relatively low content of dissolved solids, sulfates, and chlorides. It is mostly soft but ranges to hard in some sandstones. Some water use problems are caused by locally high concentrations of iron and manganese. Also, concentrations of nitrates have been detected in a few wells.

Generally, the ground-water flow is toward local streams and rivers through seepage and spring discharge. Flow is controlled by local topography. It is well defined in areas of high narrow ridges and deep narrow valleys. Flow is greatest where valleys are deeply entrenched into the aquifer. Regional flow of deep aquifers is toward the Mississippi or Wisconsin Rivers (Zaporozec and Cotter, 1985). Probable well yields in thick sandstone and sand and gravel aquifers range from 100 to more than 1,000 gallons per minute. Yields are lower where the aquifers are thin.

Transportation Facilities and Industry

Jackson County has more than 1,000 miles of local roads, about 230 miles of county roads, 145 miles of State and Federal roads, and 40 miles of Interstate highways (Wisconsin Department of Transportation, 1990). Interstate 94 crosses the county from northwest to southeast.

The county has about 60 miles of railroad. The Chicago and North Western Railroad provides daily service to Fairchild, Merrillan, and Millston. The Green Bay and Western Railroad provides daily service to Merrillan, Hixton, and Taylor. An airport for small planes is in Black River Falls. There is no regular commercial air service in the county.

Early industry of Jackson County consisted of lumbering and agricultural activities. Agriculture, especially dairying, was the center around which most other commerce and industry revolved. Over the past 24 years, the number of farms has declined from 1,087 farms with an average size of 250 acres to about 850 farms with an average size of about 296 acres (University of Wisconsin-Madison, 1986; Wisconsin Department of Agriculture, Trade, and Consumer Protection/USDA, 1990).

How This Survey Was Made

This survey was made to provide information about the soils in the survey area. The information includes a description of the soils and their location and a discussion of their suitability, limitations, and management for specified uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

The soils in the survey area are in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil is associated with a particular kind of landform or with a segment of the landform. By observing the soils in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept or model of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based

mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Some of the descriptions, names, and delineations of the soils in this survey area do not agree with those of the soils in adjacent survey areas. Differences are the result of variations in the intensity of mapping or in the extent of the soils in the survey areas.

General Soil Map Units

The general soil map in this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, it consists of one or more major soils and some minor soils. It is named for the major soils. The components of one map unit can occur in another but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

Soil Descriptions

1. Absco-Northbend-Kalmarville Association

Very deep, nearly level and gently sloping, moderately well drained to poorly drained, sandy and silty soils; on flood plains

These soils are on the flood plains along rivers and large streams. Absco soils are on the higher parts of the flood plain that are subject to scour erosion and deposition of sand, Northbend soils are in the slightly lower positions, and Kalmarville soils are in the lowest positions on the flood plain. In some places the soils in this association are dissected by abandoned stream and river channels that are partially filled with water.

This association makes up about 2 percent of the county. It is about 35 percent Absco and similar soils, 25 percent Northbend and similar soils, 20 percent Kalmarville and similar soils, and 20 percent soils of minor extent.

Absco soils are subject to occasional flooding for brief periods. They formed in siliceous, dominantly sandy alluvium. They are moderately well drained. Permeability is rapid. The available water capacity is low. Typically, the surface layer is dark brown loamy sand about 4 inches thick. The subsoil is brown, very friable sand about 10 inches thick. The upper part of the substratum is pale brown sand about 21 inches thick. The next part is about 7 inches thick. It is pale brown, mottled loamy sand with thin strata of silt loam and fine sandy loam. The lower part of the substratum to a depth of about 60 inches is very pale brown, mottled sand.

Northbend soils are subject to frequent flooding for brief periods. They formed in mostly silty and loamy alluvium and in the underlying sandy alluvium. They are somewhat poorly drained. Permeability is moderate or moderately rapid in the silty and loamy alluvium and rapid in the sandy alluvium. The available water capacity is moderate. Typically, the surface layer is dark brown silt loam about 7 inches thick. The subsoil is about 29 inches thick. It is mottled. The upper part is dark brown, friable silt loam; the next part is dark brown, friable loam; and the lower part is dark brown, very friable loamy fine sand. The substratum to a depth of about 60 inches is brown and very pale brown, mottled sand with a few thin strata of dark brown loamy sand.

Kalmarville soils are subject to frequent flooding for brief periods. They formed in recent loamy alluvium underlain by sandy alluvium. They are poorly drained. Permeability is moderate or moderately rapid in the loamy alluvium and rapid in the sandy alluvium. The available water capacity is high. Typically, the surface layer is very dark brown, mottled silt loam about 6 inches thick. The next layer is dark gray, mottled very fine sandy loam about 31 inches thick. It has strata of grayish brown and dark grayish brown silt loam and fine sandy loam. The upper part of the subsoil is light brownish gray, mottled fine sandy loam about 5 inches thick. It has strata of grayish brown very fine sandy loam and silt loam. The lower part of the substratum to a depth of about 60 inches is light brownish gray sand.

Some of the minor soils in this association are Adder, Dunnville, Impact, Newlang, Tint, and Sparta

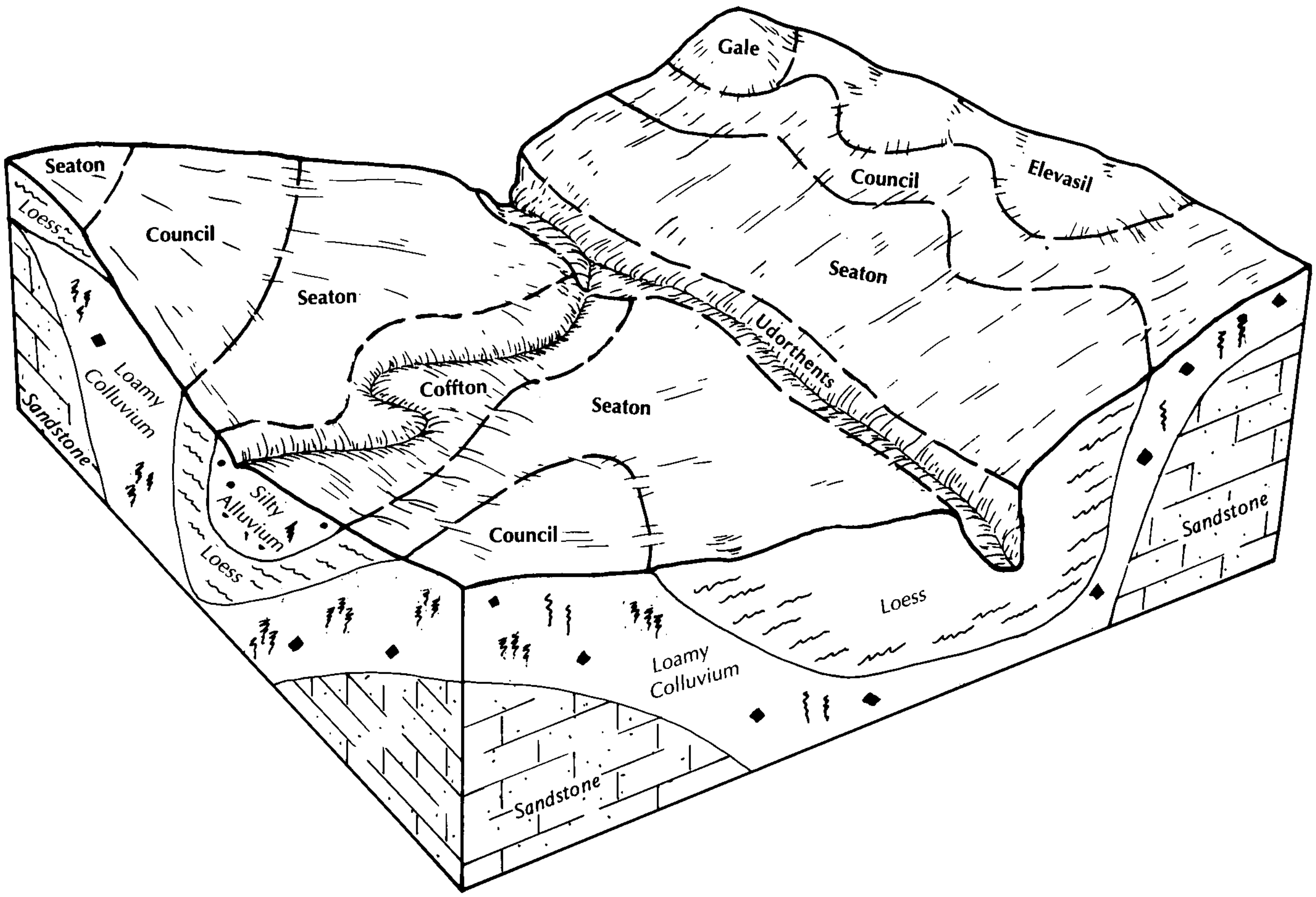

Figure 2.—Relationship of soils, topography, and parent material in the Seaton-Council association.

soils. The very poorly drained Adder and poorly drained Newlang soils are in positions on the flood plain similar to those of the Kalmarville soils. Adder soils formed in organic material overlying siliceous sandy alluvium. Newlang soils formed dominantly in siliceous sandy alluvium. The well drained Dunnville soils formed in loamy alluvium overlying sandy alluvium on low stream terraces. The excessively drained Impact and moderately well drained Tint soils are on stream terraces and pediments. They formed in siliceous sandy alluvium or residuum derived from sandstone. The excessively drained Sparta soils are on low stream terraces. They formed in sandy outwash.

Most areas of the Absco and Northbend soils are wooded. A few areas are used as pasture or cropland. Most areas of the Kalmarville soils support native wetland vegetation. A few areas are used as pasture. The Absco and Northbend soils are suited to trees, but most areas of the Kalmarville soils are not forested or managed for trees.

A few areas of the Absco and Northbend soils are cultivated. The Kalmarville soils are generally not suited to cultivated crops because of the flooding and wetness.

The major soils in this association are generally unsuited to septic tank absorption fields and dwellings because of the flooding and the wetness.

2. Seaton-Council Association

Very deep, gently sloping to steep, well drained, silty and loamy soils; on uplands

These soils are on bedrock-controlled uplands. Seaton soils are on summits and shoulders and on back slopes, head slopes, and foot slopes. Council soils are on back slopes, head slopes, and foot slopes.

This association makes up about 14 percent of the county. It is about 50 percent Seaton and similar soils, 25 percent Council soils, and 25 percent soils of minor extent (fig. 2).

Seaton soils formed in loess. They are gently

sloping to steep. Permeability is moderate. The available water capacity is very high. In the more sloping cultivated areas, much of the original surface layer has been lost through erosion. Typically, the remaining surface layer is dark brown silt loam about 9 inches thick. It is mixed with some brown subsoil material. The subsoil is friable silt loam about 37 inches thick. It is brown in the upper part and dark yellowish brown and mottled in the lower part. The substratum to a depth of about 60 inches is pale brown, mottled silt loam. The mottles in the lower part of the subsoil and the substratum are relict and are not associated with a seasonal high water table.

Council soils formed in loamy colluvium. They are sloping to steep. Permeability is moderate. The available water capacity is high. In most cultivated areas, much of the original surface layer has been lost through erosion. Typically, the remaining surface layer is dark brown loam about 7 inches thick. It is mixed with dark yellowish brown subsoil material. The subsoil is about 38 inches thick. It is dark yellowish brown, friable loam in the upper part and dark yellowish brown, friable sandy loam in the lower part. The substratum to a depth of about 60 inches is light yellowish brown and dark yellowish brown, mottled silt loam that has pockets or layers of loam. The mottles in the substratum are relict and are not associated with a seasonal high water table.

Some of the minor soils in this association are Coffton, Elevasil, Ettrick, Gale, and Orion soils and the loamy, very steep Udorthents. The somewhat poorly drained Coffton soils formed in silty alluvium on flood plains and alluvial fans. The poorly drained Ettrick soils formed in silty alluvium on flood plains. The somewhat poorly drained Orion soils formed in light colored, mostly silty alluvium overlying a buried soil with a dark colored A horizon. They are on flood plains. The well drained Elevasil soils formed mostly in siliceous loamy colluvium and siliceous sandy residuum derived from the underlying sandstone on hills. The well drained Gale soils are in positions similar to those of the Seaton and Council soils. They formed dominantly in loess overlying sandy residuum derived from the underlying sandstone. The well drained Udorthents are on back slopes and foot slopes of gullies on stream terraces. These soils formed in loess or in silty and loamy alluvium or colluvium.

Most of the less sloping areas of this association are used for cultivated crops. The steeper areas are mostly used for pasture or are wooded. The gently sloping to moderately steep areas are well suited to hay and pasture and are suited to cultivated crops. The major soils are well suited to trees.

The major soils in this association generally are well suited to septic tank absorption fields and dwellings in gently sloping areas. They are moderately suited to these uses in sloping areas, poorly suited in moderately steep areas, and generally unsuited in steep areas.

3. Urne-Council-La Farge Association

Moderately deep and very deep, gently sloping to very steep, well drained, loamy and silty soils; on uplands

These soils are on bedrock-controlled uplands. Urne soils are on shoulders and back slopes of knolls, ridges, and hills. Council soils are on back slopes, foot slopes, and head slopes. La Farge soils are on summits and shoulders and on back slopes and nose slopes and the upper foot slopes of knolls, ridges, and hills.

This association makes up about 10 percent of the county. It is about 30 percent Urne and similar soils, 25 percent Council and similar soils, 20 percent La Farge and similar soils, and 25 percent soils of minor extent (fig. 3).

Urne soils formed in loamy residuum derived from the underlying fine grained glauconitic sandstone or in loamy colluvium and residuum. These soils are sloping to very steep. Permeability is moderate or moderately rapid in the subsoil and slow to moderate in the underlying sandstone. The available water capacity is low. Typically, the surface layer is black fine sandy loam about 2 inches thick covered by about 1 inch of very dark grayish brown mucky peat. The subsoil is olive brown and light olive brown, friable fine sandy loam about 34 inches thick. The substratum to a depth of about 60 inches is weakly cemented, fine grained glauconitic sandstone.

Council soils formed in loamy colluvium. They are sloping to very steep. Permeability is moderate. The available water capacity is high. In most cultivated areas, much of the original surface layer has been lost through erosion. Typically, the remaining surface layer is dark brown loam about 7 inches thick. It is mixed with dark yellowish brown subsoil material. The subsoil is about 38 inches thick. It is dark yellowish brown, friable loam in the upper part and dark yellowish brown, friable sandy loam in the lower part. The substratum to a depth of about 60 inches is light yellowish brown and dark yellowish brown, mottled silt loam that has pockets or layers of loam. The mottles in the substratum are relict and are not associated with a seasonal high water table.

La Farge soils formed mostly in loess and loamy

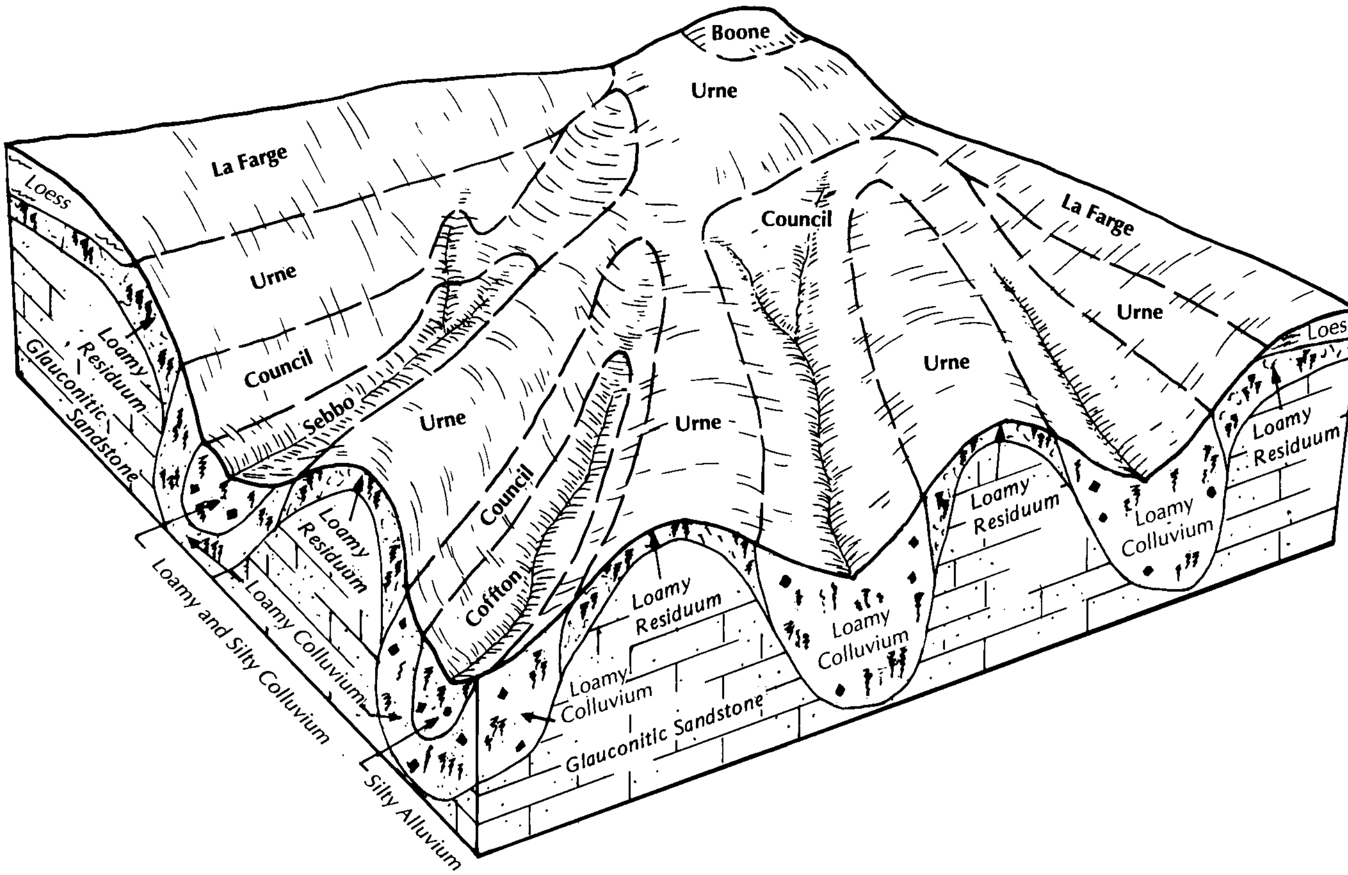

Figure 3.—Relationship of soils, topography, and parent material in the Urne-Council-La Farge association.

residuum derived from the underlying fine grained glauconitic sandstone. These soils are gently sloping to steep. Permeability is moderate in the subsoil and slow to moderate in the underlying sandstone. The available water capacity is moderate. In most cultivated areas, much of the original surface layer has been lost through erosion. Typically, the remaining surface layer is dark grayish brown silt loam about 6 inches thick. It is mixed with some yellowish brown subsoil material. The subsoil is about 31 inches thick. It is yellowish brown and dark yellowish brown, friable silt loam in the upper part and olive brown, friable loam in the lower part. The substratum to a depth of about 60 inches is weakly cemented, fine grained glauconitic sandstone.

Some of the minor soils in this association are Boone, Coffton, Ettrick, Houghton, Orion, Seaton, and Sebbo soils. The excessively drained Boone soils are on summits and shoulders and on nose slopes and back slopes. They formed in siliceous sandy residuum derived from the underlying sandstone. The somewhat poorly drained Coffton soils formed in silty alluvium on flood plains and alluvial fans. The poorly drained Ettrick soils formed in silty alluvium on flood plains. The somewhat poorly drained Orion soils formed in light colored, mostly silty alluvium overlying a buried soil with a dark colored A horizon. They are on flood plains. The very poorly drained Houghton soils formed in organic material more than 51 inches thick on flood plains. The well drained Seaton soils formed in loess on summits, shoulders, and back slopes. The moderately well drained Sebbo soils formed in loamy and silty colluvium on toe slopes.

Most of the less sloping areas of this association are used for cultivated crops or pasture. The steeper areas are mostly wooded or are planted to pine trees. These soils are well suited to trees. The gently sloping to moderately steep areas are well suited to hay and pasture and are suited to cultivated crops.

The gently sloping and sloping areas of this association are poorly suited to septic tank absorption fields and moderately suited to dwellings. The moderately steep areas are poorly suited to these uses, and the steep and very steep areas are generally unsuited.

4. Tarr-Boone-Rockdam Association

Moderately deep and very deep, nearly level to very steep, excessively drained and moderately well drained, sandy soils; on uplands, pediments, and stream terraces

Tarr and Rockdam soils are on stream terraces and pediments. Tarr soils are on head slopes, back slopes, foot slopes, and toe slopes. Rockdam soils are on toe slopes. Boone soils are on summits and shoulders and on back slopes and nose slopes of ridges, knolls, and hills on bedrock-controlled uplands.

This association makes up about 26 percent of the county. It is about 45 percent Tarr and similar soils, 25 percent Boone and similar soils, 15 percent Rockdam and similar soils, and 15 percent soils of minor extent (fig. 4).

Tarr soils formed in siliceous sandy alluvium or siliceous residuum derived from sandstone. They are excessively drained and are nearly level to very steep. Permeability is rapid. The available water capacity is low. Typically, the surface layer is very dark grayish brown sand about 8 inches thick. The subsoil is dark brown and strong brown, loose sand about 28 inches thick. The substratum to a depth of about 60 inches is yellow sand.

Boone soils formed in siliceous sandy residuum derived from the underlying sandstone. They are excessively drained and are gently sloping to very steep. Permeability is rapid in the sandy residuum and moderately slow or moderate in the underlying sandstone. The available water capacity is low or very low. Typically, the surface layer is very dark grayish brown sand about 2 inches thick covered by about 1 inch of very dark grayish brown mucky peat. The subsurface layer is brown sand about 5 inches thick. The subsoil is dark yellowish brown, very friable sand about 13 inches thick. The upper part of

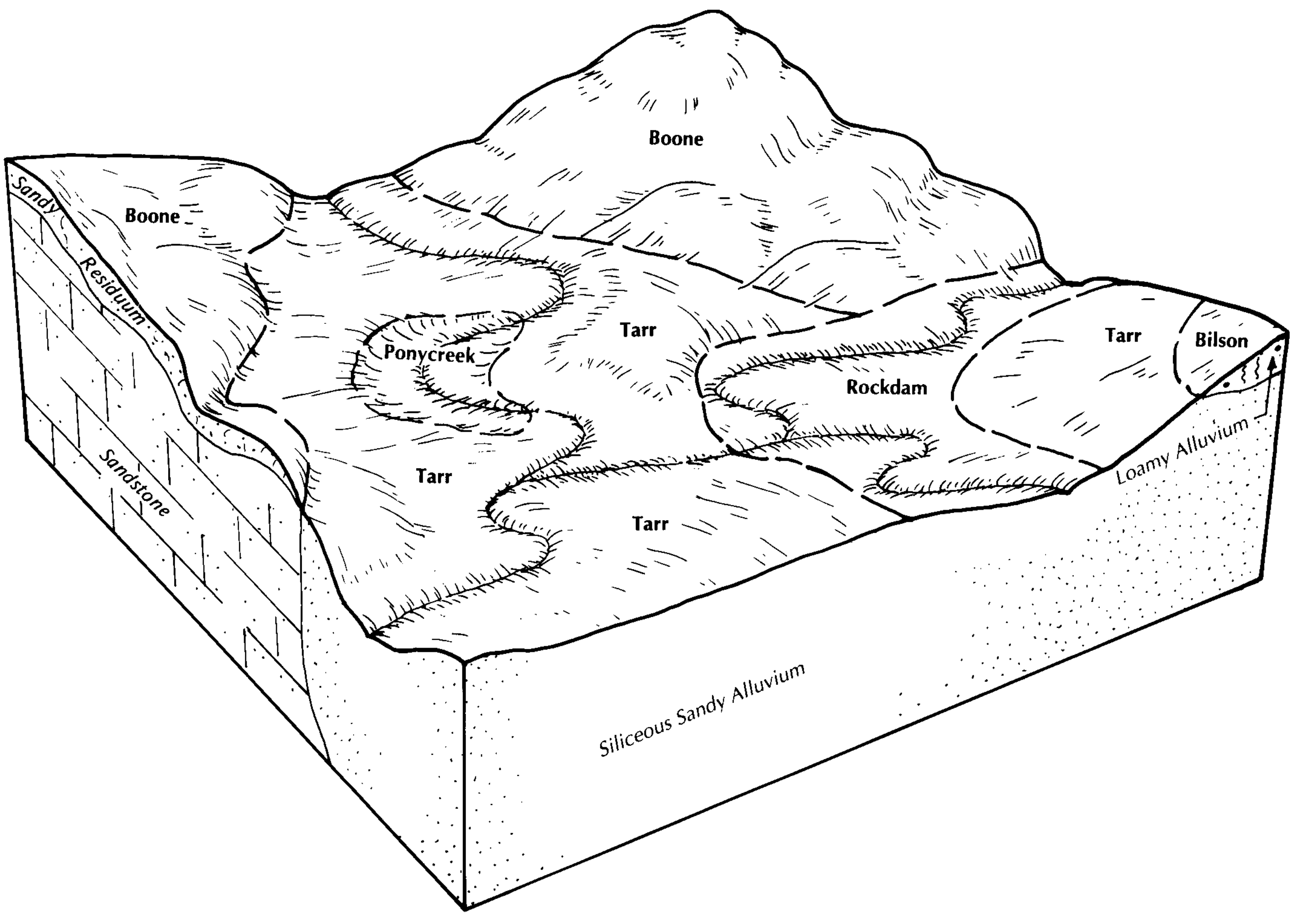

Figure 4.—Relationship of soils, topography, and parent material in the Tarr-Boone-Rockdam association.

the substratum is brownish yellow sand about 14 inches thick. The lower part of the substratum to a depth of about 61 inches is weakly cemented sandstone.

Rockdam soils formed in siliceous sandy alluvium or residuum derived from sandstone. They are moderately well drained and are nearly level and gently sloping. Permeability is rapid or very rapid. The available water capacity is low. Typically, the surface layer is very dark gray sand about 2 inches thick covered by about 2 inches of very dark grayish brown mucky peat. The subsurface layer is dark grayish brown sand about 3 inches thick. The subsoil is dark brown and yellowish brown, very friable sand about 21 inches thick. The upper part of the substratum is brownish yellow sand about 16 inches thick. The next part is yellow, mottled sand about 10 inches thick. The lower part of the substratum to a depth of about 61 inches is light gray, mottled sand.

Some of the minor soils in this association are Adder, Bilmod, Bilson, Council, Dawsil, Ironrun, Majik, Newlang, and Ponycreek soils. Adder and Newlang soils are on flood plains. Dawsil and Ponycreek soils are in depressions. The very poorly drained Adder and Dawsil soils formed in organic material overlying siliceous sandy alluvium. The poorly drained Newlang and Ponycreek soils formed in siliceous sandy alluvium. The well drained Bilson and moderately well drained Bilmod soils are in positions on the landscape similar to those of the Tarr soils. Bilson and Bilmod soils formed in siliceous loamy alluvium overlying siliceous sandy alluvium. The well drained Council soils are in concave positions on foot slopes and head slopes. They formed in loamy colluvium. The somewhat poorly drained Ironrun and Majik soils are lower on the landscape than the Tarr soils. They formed in siliceous sandy alluvium.

Most areas of this association are wooded. Some areas are used for pasture or are planted to pine trees. A few less sloping areas are used as cropland. These soils are suited to pine trees. Hardwood trees generally grow slowly and are poorly shaped. Because of the low or very low available water capacity, the nearly level to moderately steep areas are generally poorly suited to hay and pasture and to cultivated crops. The more sloping areas are generally unsuited to these uses.

The major soils in this association are poorly suited to septic tank absorption fields because they do not adequately filter the effluent. The nearly level and gently sloping areas are generally well suited to dwellings. The sloping and moderately steep areas are only moderately suited to dwellings, and the steep and very steep areas are generally unsuited.

5. Bilson-Elevasil-Merit Association

Moderately deep and very deep, nearly level to steep, well drained, loamy and silty soils; on stream terraces, pediments, and uplands

Bilson and Merit soils are on stream terraces and pediments. Bilson soils are on low knolls and head slopes, foot slopes, and toe slopes. Merit soils are on knolls and toe slopes. Elevasil soils are on summits and shoulders and on nose slopes, back slopes, and the upper foot slopes of hills and ridges on pediments and on bedrock-controlled uplands.

This association makes up about 10 percent of the county. It is about 55 percent Bilson and similar soils, 15 percent Elevasil and similar soils, 15 percent Merit and similar soils, and 15 percent soils of minor extent (fig. 5).

Bilson soils formed in siliceous loamy alluvium overlying siliceous sandy alluvium. They are nearly level to moderately steep. Permeability is moderate or moderately rapid in the subsoil and rapid in the substratum. The available water capacity is moderate. Typically, the surface layer is very dark brown sandy loam about 8 inches thick. The subsoil is dark yellowish brown, dark brown, and strong brown, friable sandy loam about 24 inches thick. The substratum to a depth of about 60 inches is brownish yellow sand that has a few thin strata of dark brown loamy sand.

Elevasil soils formed mostly in siliceous loamy colluvium and siliceous sandy residuum derived from the underlying sandstone. They are gently sloping to steep. Permeability is moderate or moderately rapid in the loamy part of the subsoil, rapid in the sandy part of the subsoil and in the substratum, and moderately slow or moderate in the underlying sandstone. The available water capacity is low. In most cultivated areas, much of the original surface layer has been lost through erosion. In wooded areas the surface layer is typically very dark brown sandy loam about 2 inches thick covered by about 1 inch of very dark grayish brown mucky peat. The subsoil is about 28 inches thick. It is dark yellowish brown and strong brown, friable sandy loam in the upper part and strong brown, very friable loamy sand in the lower part. The upper part of the substratum is reddish yellow sand about 8 inches thick. The lower part to a depth of about 60 inches is weakly cemented sandstone.

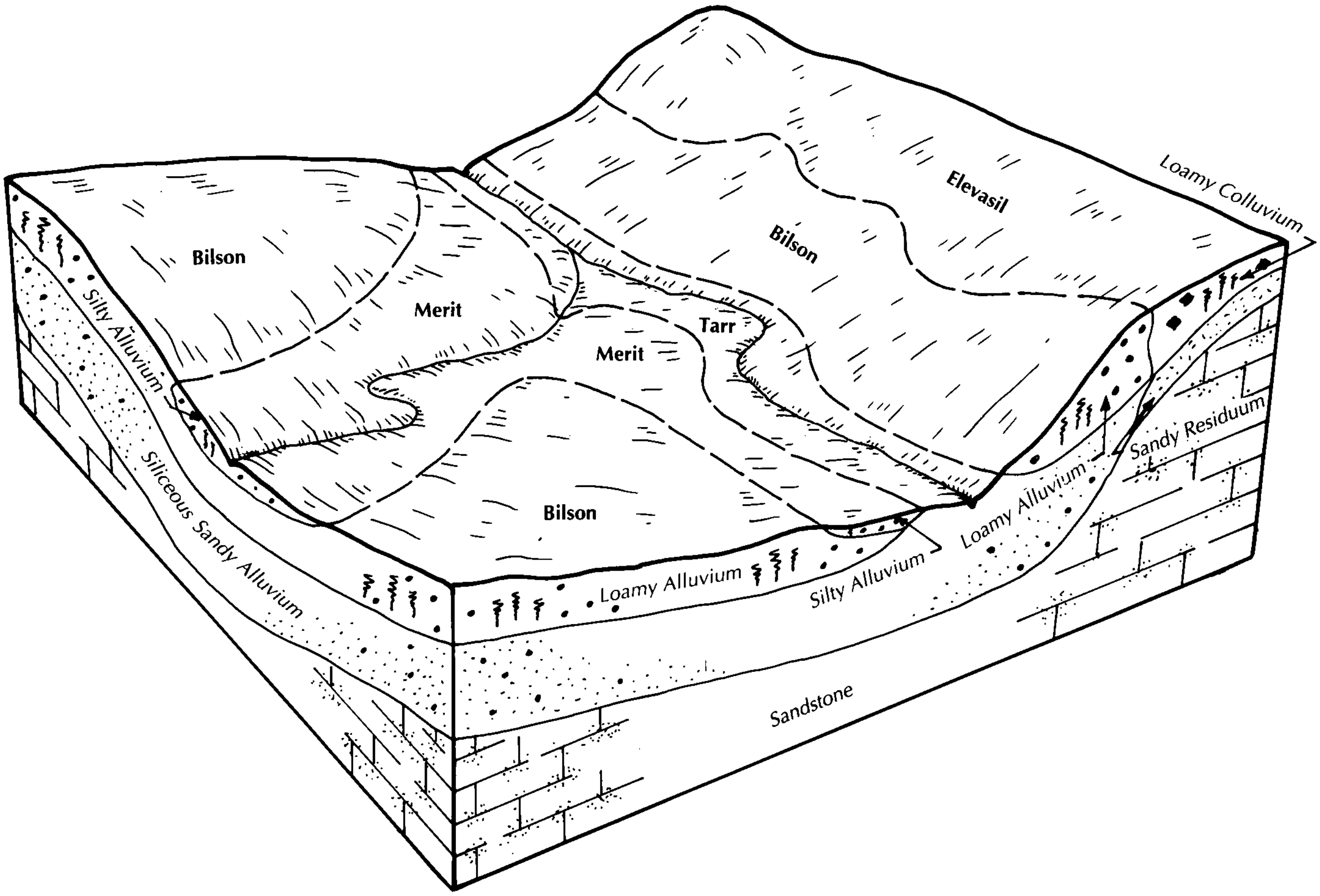

Figure 5.—Relationship of soils, topography, and parent material in the Bilson-Elevasil-Merit association.

Merit soils formed in silty alluvium and in the underlying loamy alluvium underlain by siliceous sandy alluvium. They are nearly level or gently sloping. Permeability is moderate in the subsoil and rapid in the substratum. The available water capacity is moderate. Typically, the surface layer is very dark grayish brown silt loam about 9 inches thick. The subsoil is about 21 inches thick. It is friable. The upper part is dark yellowish brown silt loam, and the lower part is dark brown loam. The substratum to a depth of about 60 inches is strong brown sand.

Some of the minor soils in this association are Adder, Boone, Bilmod, Council, Gale, Merimod, Seaton, and Tarr soils. The very poorly drained Adder soils formed in organic material overlying siliceous sandy alluvium on flood plains. The excessively drained Boone soils are in convex positions higher than those of the Elevasil soils. They formed in siliceous sandy residuum derived from the underlying sandstone. The moderately well drained Bilmod soils are in positions slightly lower than those of the Bilson soils. They formed in materials similar to those in which the Bilson soils formed. The well drained Gale and Seaton soils are in positions similar to those of the Elevasil soils. Gale soils formed dominantly in loess overlying sandy residuum derived from the underlying sandstone. Seaton soils formed in loess. The moderately well drained Merimod soils are in positions slightly lower than those of the Merit soils. They formed in materials similar to those in which the Merit soils formed. The excessively drained Tarr soils are in positions similar to those of the Bilson soils. They formed in siliceous sandy alluvium or siliceous residuum derived from sandstone. The well drained Council soils are in concave positions on foot slopes and head slopes. They formed in loamy colluvium.

Most of the nearly level to sloping areas of this association are used for cultivated crops. The more sloping areas are generally used for pasture or are wooded. Most areas of these soils are suited to hay and pasture and to trees. Hardwood trees grow slowly and are poorly shaped in areas of the Elevasil soils. These soils are better suited to pine trees. The

less sloping areas of the major soils are suited to cultivated crops.

The major soils are poorly suited to septic tank absorption fields because of a thin layer over bedrock, poor filtering material, or seasonal wetness. Steep and very steep areas are generally unsuited because of the slope. The nearly level and gently sloping areas are well suited or moderately suited to dwellings. Sloping areas are only moderately suited to dwellings, moderately steep areas are poorly suited, and steep and very steep areas are generally unsuited.

6. Elm Lake-Fairchild Association

Moderately deep, nearly level and gently sloping, somewhat poorly drained and poorly drained, sandy and mucky soils; on pediments

Elm Lake soils are in drainageways and depressions, and Fairchild soils are on toe slopes on pediments.

This association makes up about 4 percent of the county. It is about 50 percent Elm Lake and similar soils, 40 percent Fairchild and similar soils, and 10 percent soils of minor extent.

Elm Lake soils formed in siliceous sandy alluvium overlying loamy residuum derived from the underlying interbedded sandstone and shale. They are poorly drained. Permeability is rapid in the sandy alluvium, moderately slow or moderate in the loamy residuum, and extremely slow to moderately slow in the underlying interbedded sandstone and shale. The available water capacity is low. Typically, the surface layer is black muck about 4 inches thick. The subsurface layer is very dark gray sand about 4 inches thick. The upper part of the substratum is gray, loose sand. The next part is grayish brown, mottled, loose loamy sand over light brownish gray, mottled, firm clay loam. The lower part of the substratum from a depth of about 38 to 60 inches is weakly cemented interbedded sandstone and shale.

Fairchild soils formed in siliceous sandy alluvium and loamy residuum derived from the underlying interbedded sandstone and shale. They are somewhat poorly drained. Permeability is rapid in the sandy alluvium, moderately slow or moderate in the loamy residuum, and extremely slow to moderately slow in the underlying interbedded sandstone and shale. The available water capacity is low. Typically, the surface layer is black sand about 2 inches thick covered by about 2 inches of very dark grayish brown mucky peat. The subsurface layer is grayish brown sand about 9 inches thick. The subsoil is about 26 inches thick. The upper part is dark reddish brown, very friable sand. The next part is dark brown and brownish yellow, mottled, very friable sand. The lower part is pale olive, mottled, firm clay loam. The substratum to a depth of about 60 inches is weakly cemented interbedded sandstone and shale.

Some of the minor soils in this association are Citypoint, Dawsil, Ironrun, Ludington, Rockdam, and Tarr soils. Citypoint and Dawsil soils are very poorly drained. Citypoint soils formed in organic material overlying interbedded sandstone and shale in drainageways and depressions. Dawsil soils formed in organic material overlying siliceous sandy alluvium in depressions. The somewhat poorly drained Ironrun soils are in positions similar to those of the Fairchild soils. They formed in siliceous sandy alluvium. The moderately well drained Ludington and Rockdam soils and the excessively drained Tarr soils are in higher positions than those of the major soils. Ludington soils formed in siliceous sandy alluvium and in loamy residuum derived from the underlying interbedded sandstone and shale. Rockdam and Tarr soils formed in siliceous sandy alluvium or residuum derived from sandstone.

Most areas of this association are wooded. Some areas are used for unimproved pasture or support native wetland vegetation. A few areas of the Fairchild soils are used for cultivated crops. The Fairchild soils are suited to trees. The Elm Lake soils are suited to conifers but are poorly suited to most other trees. The Fairchild soils are suited to pasture. If drained, the Elm Lake soils are also suited to pasture. Mainly because of wetness, the Elm Lake soils are generally unsuited to cultivated crops and the Fairchild soils are poorly suited.

The Elm Lake soils are generally unsuited to septic tank absorption fields and dwellings, primarily because of ponding. The Fairchild soils are poorly suited to these uses, mainly because of the wetness and the thin layer over bedrock.

7. Ironrun-Ponycreek-Dawsil Association

Very deep, nearly level and gently sloping, somewhat poorly drained to very poorly drained, sandy, mucky, and peaty soils; on stream terraces and pediments

Ironrun soils are on the lower toe slopes and in slight depressions. Ponycreek and Dawsil soils are in depressions.

This association makes up about 18 percent of the county. It is about 40 percent Ironrun and similar soils, 35 percent Ponycreek and similar soils, 10 percent Dawsil and similar soils, and 15 percent soils of minor extent (fig. 6).

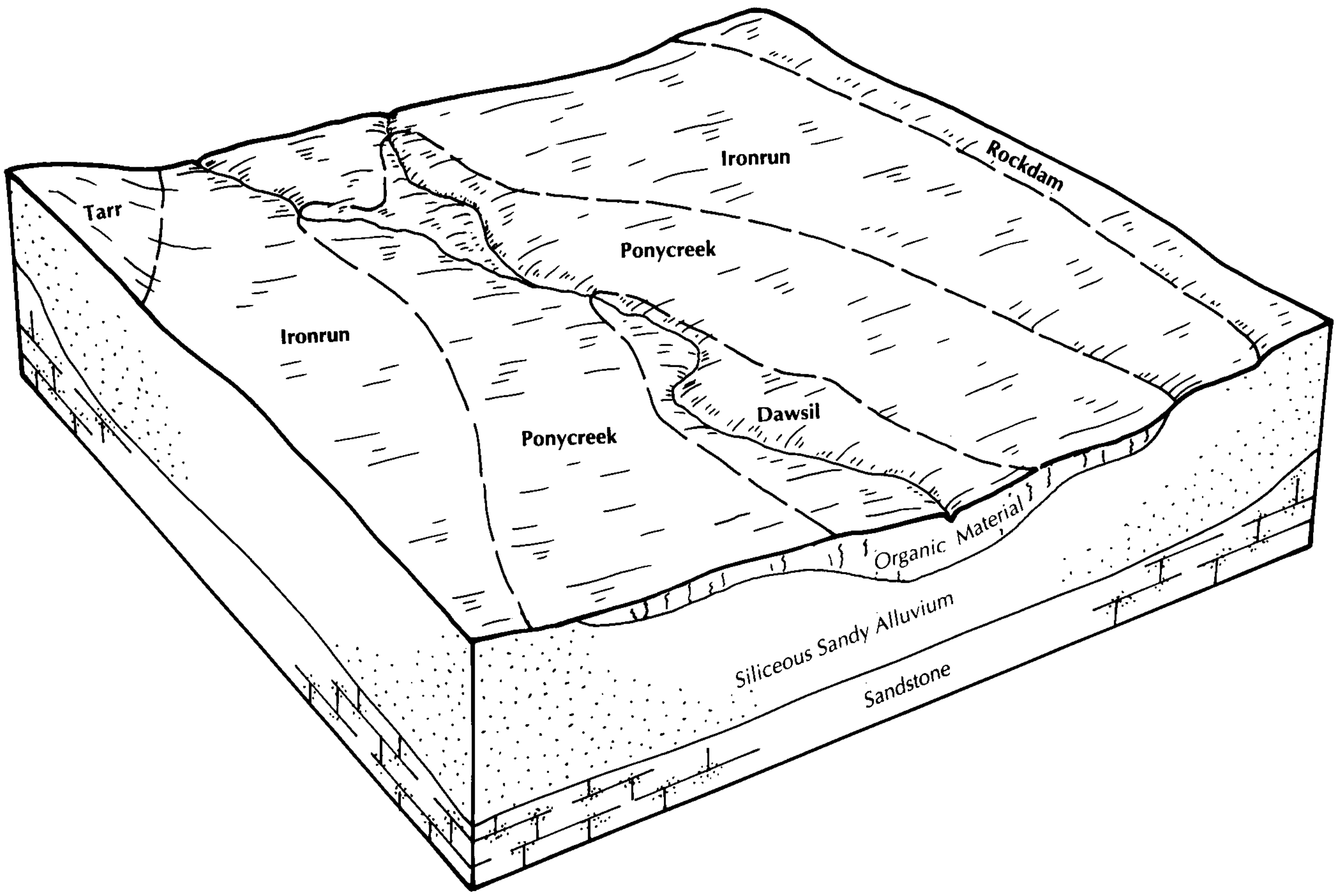

Figure 6.—Relationship of soils, topography, and parent material in the Ironrun-Ponycreek-Dawsil association.

Ironrun soils formed in siliceous sandy alluvium. They are somewhat poorly drained and are nearly level and gently sloping. Permeability is rapid or very rapid. The available water capacity is low. Typically, the surface layer is black sand about 2 inches thick covered by about 2 inches of very dark grayish brown mucky peat. The subsurface layer is gray sand about 8 inches thick. The subsoil is very friable sand about 18 inches thick. It is dark reddish brown in the upper part and mottled reddish brown and dark brown in the lower part. The substratum to a depth of about 60 inches is yellow, mottled sand.

Ponycreek soils formed in siliceous sandy alluvium. They are subject to ponding. They are poorly drained and nearly level. Permeability is rapid or very rapid. The available water capacity is low. Typically, the surface layer is black muck about 4 inches thick. The subsurface layer is black mucky sand about 2 inches thick. The subsoil is dark grayish brown and grayish brown, mottled, very friable sand about 23 inches thick. The substratum to a depth of about 60 inches is light yellowish brown sand.

Dawsil soils formed in organic material overlying siliceous sandy alluvium. They are subject to ponding. They are very poorly drained and nearly level. Permeability is moderately slow to moderately rapid in the organic layers and rapid in the sandy alluvium. The available water capacity is very high. Typically, the upper 20 inches is dark reddish brown and dark brown mucky peat. The next 20 inches is black muck. The substratum to a depth of about 60 inches is light brownish gray sand.

Some of the minor soils in this association are Boone, Loxley, Rockdam, and Tarr soils. The excessively drained Boone soils are in the highest positions. They formed in siliceous sandy residuum derived from the underlying sandstone. The very poorly drained Loxley soils are in positions on the landscape similar to those of the Dawsil soils. They formed in organic material more than 51 inches thick. The moderately well drained Rockdam and

excessively drained Tarr soils are slightly higher on the landscape than the Ironrun soils. They formed in siliceous sandy alluvium or residuum derived from sandstone.

Most areas of the Ironrun soils are wooded. A few areas are used as pasture or cropland. Most areas of the Ponycreek and Dawsil soils support native wetland vegetation or are forested. Ironrun soils are suited to trees. Ponycreek soils are suited to conifers but are poorly suited to most other trees. Dawsil soils are generally unsuited to trees, but they support stands of conifers in a few areas. Ironrun soils are suited to pasture but are poorly suited to cultivated crops, mainly because of wetness. Drained areas of the Ponycreek soils are poorly suited to cultivated crops, and undrained areas are generally unsuited. Dawsil soils are generally unsuited to pasture and cultivated crops because of the wetness and extremely acid reaction. If managed intensively, some areas of the Ponycreek and Dawsil soils are suited to cranberries and other specialty crops.

The Ironrun soils are poorly suited to septic tank absorption fields and dwellings, mainly because of the wetness. The Ponycreek and Dawsil soils are generally unsuited to these uses, mainly because of the wetness and the ponding.

8. Merrillan-Veedum-Humbird Association

Moderately deep, nearly level and gently sloping, moderately well drained to poorly drained, loamy and mucky soils; on pediments

Merrillan soils are on toe slopes. Veedum soils are in drainageways and depressions. Humbird soils are on summits and shoulders of knolls.

This association makes up about 6 percent of the county. It is about 40 percent Merrillan and similar soils, 30 percent Veedum and similar soils, 15 percent Humbird and similar soils, and 15 percent soils of minor extent (fig. 7).

Merrillan soils formed in loamy alluvium and in clayey residuum derived from the underlying interbedded sandstone and shale. These soils are somewhat poorly drained and are nearly level and gently sloping. Permeability is moderate or moderately rapid in the loamy alluvium, slow in the clayey residuum, and extremely slow to moderately slow in the underlying interbedded sandstone and shale. The available water capacity is low. Typically, the surface layer is very dark brown fine sandy loam about 3 inches thick covered by about 1 inch of very dark grayish brown mucky peat. The subsurface layer is grayish brown fine sandy loam about 2 inches thick. The subsoil is about 25 inches thick. The upper part is dark brown, friable fine sandy loam. The next part is dark brown, mottled, friable fine sandy loam. The lower part is pale brown, mottled, firm silty clay loam and light brownish gray, mottled, firm clay loam. The substratum to a depth of about 60 inches is weakly cemented interbedded sandstone and shale.

Veedum soils formed in silty alluvium and loamy residuum derived from the underlying interbedded sandstone and shale. They are poorly drained and nearly level. Permeability is moderate in the silty alluvium, moderately slow or moderate in the residuum, and extremely slow to moderately slow in the underlying interbedded sandstone and shale. The available water capacity is moderate. Typically, the surface layer is black muck about 3 inches thick. The subsurface layer is black silt loam about 6 inches thick. The subsoil is about 24 inches thick. It is dark grayish brown, mottled, friable silt loam in the upper part and grayish brown, mottled, firm clay loam in the lower part. The substratum to a depth of about 60 inches is weakly cemented interbedded sandstone and shale.

Humbird soils formed in loamy alluvium and in clayey residuum derived from the underlying interbedded sandstone and shale. These soils are moderately well drained and are nearly level and gently sloping. Permeability is moderate or moderately rapid in the loamy alluvium, slow in the clayey residuum, and extremely slow to moderately slow in the underlying interbedded sandstone and shale. The available water capacity is low. Typically, the surface layer is black fine sandy loam about 2 inches thick covered by about 1 inch of very dark grayish brown mucky peat. The subsurface layer is grayish brown fine sandy loam about 3 inches thick. The subsoil is about 24 inches thick. It is dark brown, very friable fine sandy loam in the upper part; reddish brown, firm silty clay in the next part; and light olive gray, mottled, firm silty clay in the lower part. The substratum to a depth of about 60 inches is weakly cemented interbedded sandstone and shale.

Some of the minor soils in this association are Citypoint, Dawsil, Elm Lake, Fairchild, Ludington, and Rockdam soils. The very poorly drained Citypoint and Dawsil soils are in the lowest positions on the landscape. Citypoint soils formed in organic material overlying interbedded sandstone and shale. Dawsil soils formed in organic material overlying siliceous sandy alluvium. The poorly drained Elm Lake soils are in positions similar to those of the Veedum soils. They formed in siliceous sandy alluvium overlying loamy residuum derived from the underlying

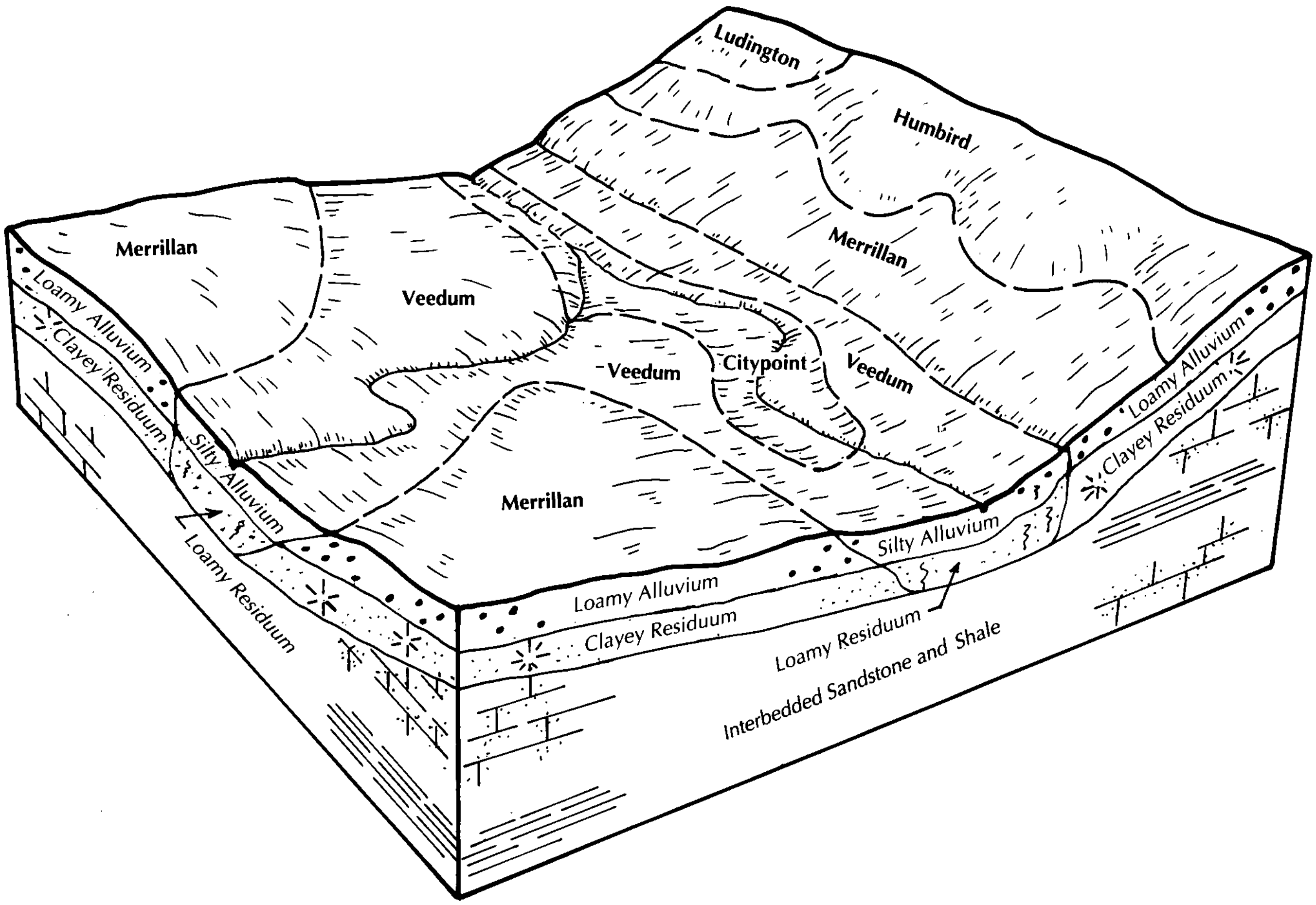

Figure 7.—Relationship of soils, topography, and parent material in the Merrillan-Veedum-Humbird association.

interbedded sandstone and shale. The somewhat poorly drained Fairchild soils are in positions similar to those of the Merrillan soils. They formed in siliceous sandy alluvium and loamy residuum derived from the underlying interbedded sandstone and shale. The moderately well drained Ludington and Rockdam soils are in positions similar to those of the Humbird soils. Ludington soils formed in siliceous sandy alluvium and in loamy residuum derived from the underlying interbedded sandstone and shale. Rockdam soils formed in siliceous sandy alluvium or residuum derived from sandstone.

Most areas of the Merrillan soils are wooded. A few areas are used as cropland or pasture. Most areas of the Veedum soils support native wetland vegetation. Most areas of the Humbird soils are used as cropland or pasture. A few areas are wooded. Merrillan and Humbird soils are suited to trees. Veedum soils are suited to some conifers but are poorly suited to most other trees. The Merrillan and Humbird soils are suited to pasture. The Humbird soils and drained areas of the Merrillan soils are suited to cultivated crops. The Veedum soils are generally unsuited to pasture and cultivated crops because of wetness and ponding.

The Merrillan and Humbird soils are generally poorly suited to septic tank absorption fields and dwellings, and the Veedum soils are generally unsuited to these uses, primarily because of the wetness and the thin layer over bedrock.

9. Loxley-Dawsil Association

Very deep, nearly level, very poorly drained, peaty soils; on lake plains, stream terraces, and pediments

These soils are in depressions. They are subject to frequent ponding.

This association makes up about 8 percent of the county. It is about 50 percent Loxley and similar soils,

40 percent Dawsil and similar soils, and 10 percent soils of minor extent.

Loxley soils formed in organic material more than 51 inches thick. Permeability is moderately slow to moderately rapid. The available water capacity is very high. Typically, the organic layers extend to a depth of more than 51 inches. The upper part is reddish brown peat about 4 inches thick, and the lower part is mostly black muck.

Dawsil soils formed in organic material overlying siliceous sandy alluvium. Permeability is moderately slow to moderately rapid in the organic layers and rapid in the sandy alluvium. The available water capacity is very high. Typically, the upper 20 inches is dark reddish brown and dark brown mucky peat. The next 20 inches is black muck. The substratum to a depth of about 60 inches is light brownish gray sand.

Some of the minor soils in this association are Boone, Ironrun, Ponycreek, Rockdam, and Tarr soils. The excessively drained Boone and Tarr soils are in the highest positions on the landscape. Boone soils are moderately deep. They formed in siliceous sandy residuum derived from the underlying sandstone. Tarr soils are very deep. They formed in siliceous sandy alluvium or residuum derived from sandstone. The somewhat poorly drained Ironrun and poorly drained Ponycreek soils are along the edges of depressions. They formed in siliceous sandy alluvium. The moderately well drained Rockdam soils are slightly higher on the landscape than the Ironrun soils. They formed in siliceous sandy alluvium or residuum derived from sandstone.

Most areas of the Loxley and Dawsil soils support wetland vegetation. The Loxley soils are suited to some conifers but are poorly suited to most other trees. The Dawsil soils are generally not suited to trees, but they support stands of conifers in a few areas. If managed intensively, some areas of the Loxley and Dawsil soils are suited to cranberries and other specialty crops.

These soils are generally unsuited to pasture, cultivated crops, septic tank absorption fields, and dwellings, mainly because of wetness and the frequent ponding.

10. Kert-Veedum Association

Moderately deep, nearly level and gently sloping, somewhat poorly drained and poorly drained, silty and mucky soils; on pediments

Kert soils are on toe slopes. Veedum soils are in drainageways and depressions.

This association makes up about 2 percent of the county. It is about 40 percent Kert and similar soils, 35 percent Veedum and similar soils, and 25 percent soils of minor extent.

Kert soils formed in loess and in residuum derived from the underlying interbedded sandstone and shale. They are somewhat poorly drained and are nearly level and gently sloping. Permeability is moderate in the loess, moderately slow or moderate in the residuum, and extremely slow to moderately slow in the underlying interbedded sandstone and shale. The available water capacity is moderate. Typically, the surface layer is black silt loam about 2 inches thick covered by about 1 inch of very dark grayish brown mucky peat. The subsurface layer is brown silt loam about 5 inches thick. The subsoil is about 23 inches thick. It is mottled. The upper part is a mixture of dark yellowish brown and brown, friable silt loam, and the lower part is olive gray, firm silty clay loam. The substratum to a depth of about 60 inches is weakly cemented interbedded sandstone and shale.

Veedum soils formed in silty alluvium and loamy residuum derived from the underlying interbedded sandstone and shale. They are poorly drained and nearly level. Permeability is moderate in the silty alluvium, moderately slow or moderate in the residuum, and extremely slow to moderately slow in the underlying interbedded sandstone and shale. The available water capacity is moderate. Typically, the surface layer is black muck about 3 inches thick. The subsurface layer is black silt loam about 6 inches thick. The subsoil is about 24 inches thick. It is dark grayish brown, mottled, friable silt loam in the upper part and grayish brown, mottled, firm clay loam in the lower part. The substratum to a depth of about 60 inches is weakly cemented interbedded sandstone and shale.

Some of the minor soils in this association are Humbird, Merrillan, and Citypoint soils. The moderately well drained Humbird soils are slightly higher on the landscape than the Kert soils. The somewhat poorly drained Merrillan soils are in positions similar to those of the Kert soils. Humbird and Merrillan soils formed in loamy alluvium and in clayey residuum derived from the underlying interbedded sandstone and shale. The very poorly drained Citypoint soils are in positions similar to those of the Veedum soils. They formed in organic material overlying interbedded sandstone and shale.

Most areas of the Kert soils are wooded or are used as cropland. Some areas are used for pasture. Most areas of the Veedum soils support native wetland vegetation. The Kert soils are suited to trees. The Veedum soils are suited to some conifers but are

poorly suited to most other trees. The Kert soils are suited to pasture and cultivated crops. The Veedum soils are generally unsuited to these uses, mainly because of wetness and ponding.

Mainly because of the wetness and the ponding, the Kert soils are poorly suited to septic tank absorption fields and dwellings and the Veedum soils are generally unsuited to these uses.

Detailed Soil Map Units

The map units delineated on the detailed maps in this survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this section, along with the maps, can be used to determine the suitability and potential of a unit for specific uses. They also can be used to plan the management needed for those uses. More information about each map unit is given under the heading "Use and Management of the Soils."

A map unit delineation on a map represents an area dominated by one or more major kinds of soil or miscellaneous areas (USDA, National Soil Survey Handbook; USDA, 1993). A map unit is identified and named according to the taxonomic classification of the dominant soils or miscellaneous areas. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils and miscellaneous areas are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some "included" areas that belong to other taxonomic classes.

Most included soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, inclusions. They may or may not be mentioned in the map unit description. Other included soils and miscellaneous areas, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, inclusions. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. The included areas of contrasting soils or miscellaneous areas are mentioned in the map unit descriptions. A few included areas may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of included areas in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans, but if intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series.* Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases.* Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Boone sand, 6 to 15 percent slopes, is a phase of the Boone series.

Some map units are made up of two or more major soils. These map units are called complexes or undifferentiated groups.

A *complex* consists of two or more soils in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils are somewhat similar in all areas. Humbird-Merrillan fine sandy loams, 0 to 6 percent slopes, is an example.

An *undifferentiated group* is made up of two or

more soils that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils in a mapped area are not uniform. An area can be made up of only one of the major soils, or it can be made up of all of them. Council and Seaton soils, 20 to 30 percent slopes, is an undifferentiated group in this survey area.

This survey includes *miscellaneous areas.* Such areas have little or no soil material and support little or no vegetation. The map unit "Pits" is an example.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils or miscellaneous areas.

AbA—Absco loamy sand, 0 to 3 percent slopes

This very deep, nearly level and gently sloping, moderately well drained soil is on flood plains along rivers and large streams. It is subject to occasional flooding for brief periods. Individual areas are long and narrow and generally range from 5 to 80 acres in size.

Typically, the surface layer is dark brown loamy sand about 4 inches thick. The subsoil is brown, very friable sand about 10 inches thick. The upper part of the substratum is pale brown sand about 21 inches thick. The next part is about 7 inches thick. It is pale brown, mottled loamy sand that has thin strata of silt loam and fine sandy loam. The lower part of the substratum to a depth of about 60 inches is mottled, very pale brown sand. In places the surface layer is sand, loamy fine sand, or sandy loam.

Included with this soil in mapping are small areas of the poorly drained Kalmarville, somewhat poorly drained Northbend, and excessively drained Tarr soils. Also included are many areas of abandoned river and stream channels. Some are partially filled with water. Kalmarville and Northbend soils are in the lower positions on the landscape. They have more silt and clay in the surface layer and the upper part of the substratum than the Absco soil. Tarr soils are in the higher positions. Included areas make up 10 to 15 percent of the unit.

Permeability is rapid in the Absco soil. The available water capacity is low. The content of organic matter is low or moderately low in the surface layer. The surface layer is very friable and can be easily tilled throughout a wide range in moisture content. An apparent seasonal high water table is at a depth of 3.5 to 6.0 feet.

Most areas are wooded. A few areas are used for pasture. This soil is generally not suited to crops because of the occasional flooding and the low available water capacity.

A cover of pasture plants is effective in controlling soil blowing. Also, it helps to control water erosion and scouring caused by flooding. Forage yields are generally low unless fertilizer is applied and adequate moisture is available. Planting early in the spring, before the soil has a chance to dry, helps to overcome the droughtiness. Later plantings are likely to have a poor survival rate. Overgrazing can cause surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Measures that improve fertility, proper stocking rates, and pasture rotation help to keep the pasture in good condition.

This soil is suited to trees, especially pines. The equipment limitation and seedling mortality are management concerns. Equipment use is restricted by the loose sand and the flooding. These restrictions can be reduced by using equipment during the winter when the surface is frozen and the flooding hazard is less severe. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Log landings and haul roads are subject to repeated use by heavy equipment. These areas can be established in better suited included or adjacent areas that are not subject to flooding. If they are established in areas of this soil, the loose sand can be stabilized with gravel or crushed rock. Culverts and ditches can be used along haul roads to maintain natural drainage systems. Seedling mortality caused by droughtiness can be reduced by careful planting of vigorous nursery stock or containerized seedlings. It can also be reduced by planting when the soil is moist. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or mechanical removal.

This soil generally is not suitable as a site for septic tank absorption fields, dwellings, or local roads, mainly because of the flooding. Overcoming this limitation is difficult. A better suited site should be considered.

The land capability classification is IVs. The woodland ordination symbol is 3S (Black oak). The primary forest habitat type commonly is PVRh, and the secondary forest habitat type is PVGy.

AcA—Absco-Northbend complex, 0 to 3 percent slopes

These soils are very deep and are nearly level and gently sloping. They are on flood plains along rivers and large streams (fig. 8). The moderately well drained Absco soil is subject to occasional flooding for brief periods. The somewhat poorly drained Northbend soil is frequently flooded for brief periods. The Absco and Northbend soils occur as areas so intricately mixed or so small that it was not practical to map them separately. Individual areas are long and narrow and range from 20 to 500 acres in size. They are about 40 to 60 percent Absco soil and 30 to 50 percent Northbend soil.

Typically, the surface layer of the Absco soil is dark brown loamy sand about 4 inches thick. The substratum extends to a depth of about 60 inches. It is yellowish brown and light yellowish brown sand in the upper part and light yellowish brown, mottled sand in the lower part. In places the surface layer is loamy fine sand, sand, or loamy sand.

Typically, the surface layer of the Northbend soil is dark brown silt loam about 7 inches thick. The subsoil is about 29 inches thick. It is mottled and is friable or very friable. The upper part is dark brown silt loam, the next part is dark brown loam, and the lower part is dark brown loamy fine sand. The substratum to a depth of about 60 inches is brown and very pale brown, mottled sand that has a few thin strata of dark

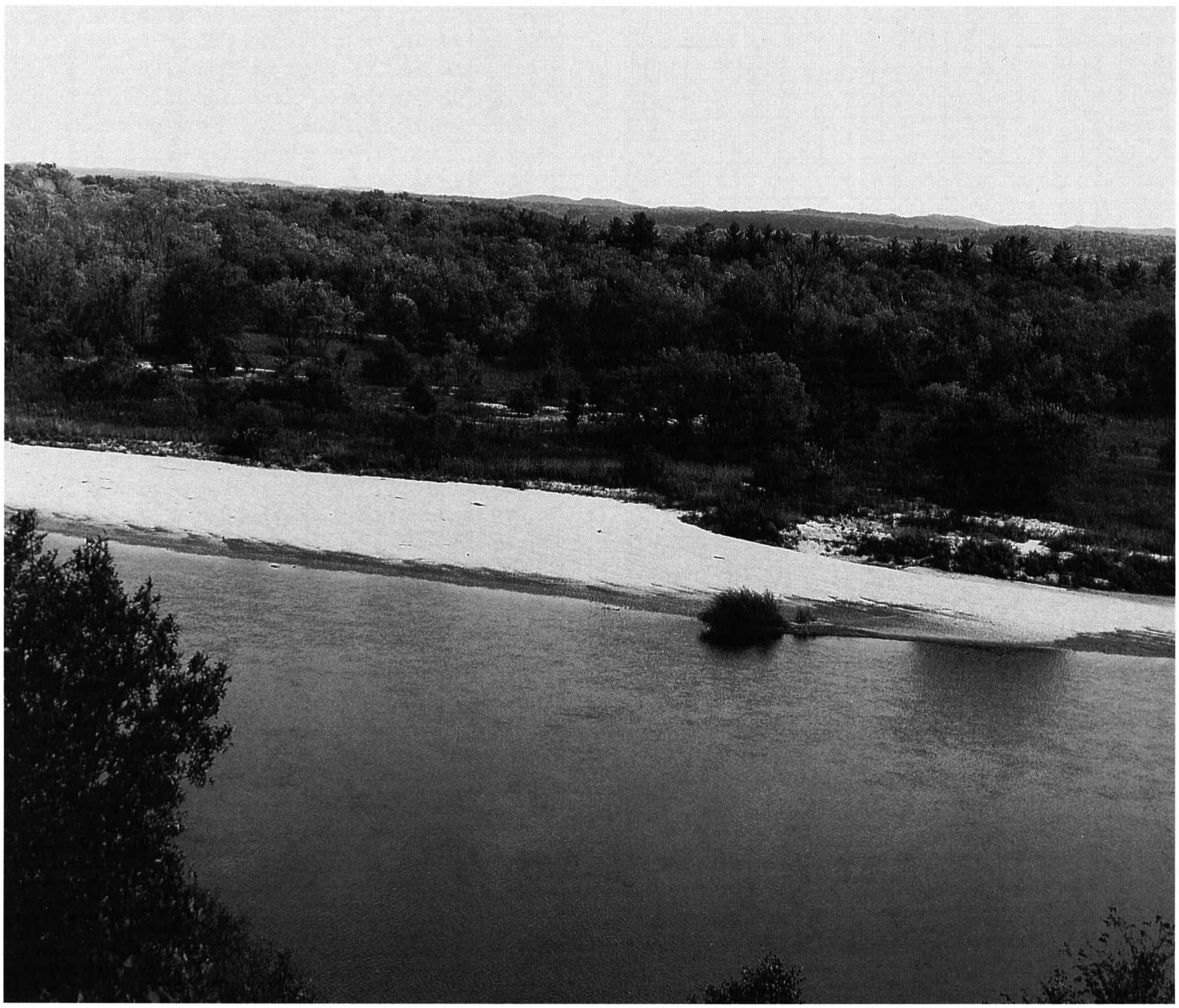

Figure 8.—An area of Absco-Northbend complex, 0 to 3 percent slopes, along the Black River.

brown loamy sand. In places the surface layer and the subsoil are mostly fine sandy loam.

Included with these soils in mapping are small areas of the poorly drained Kalmarville and excessively drained Tarr soils. Also included are many areas of abandoned river and stream channels. Some are partially filled with water. Kalmarville soils are in the lower positions on the landscape. They have a content of silt and clay similar to that of the Northbend soil. Tarr soils are in the higher positions. They have a sand content similar to that of the Absco soil. Included areas make up 5 to 25 percent of the unit.

Permeability is rapid in the Absco soil. It is moderate or moderately rapid in the silty and loamy alluvium in the Northbend soil and rapid in the sandy alluvium. The content of organic matter is low or moderately low in the surface layer of the Absco soil and moderate in the surface layer of the Northbend soil. The available water capacity is low in the Absco soil and moderate in the Northbend soil. An apparent seasonal high water table is at a depth of 3.5 to 6.0 feet in the Absco soil and at a depth of 1.0 to 2.0 feet in the Northbend soil. The rooting depth of most crops is limited by the seasonal high water table in the Northbend soil during wet periods of the growing season.

Most areas of these soils are wooded. Some areas are used as pasture or cropland. The Absco soil generally is not suited to crops because of the flooding and the low available water capacity. The Northbend soil is poorly suited to row crops unless it is protected from flooding. Dikes and diversions help to prevent flooding in areas of both soils. Land smoothing, a surface drainage system, and interception drains help to remove excess water in areas of the Northbend soil. Returning crop residue or other organic material to the soil reduces the amount of water lost through evaporation, increases the rate of water infiltration, maintains fertility and good tilth, and helps to control soil blowing, erosion, and scouring by floodwater.

A cover of pasture plants is effective in controlling soil blowing on the Absco soil. It also helps to control erosion and scouring on the Absco and Northbend soils during periods of flooding. Forage yields in areas of the Absco soil are generally low unless fertilizer is applied and adequate moisture is available. Planting early in spring, before the soil has a chance to dry, helps to overcome the droughtiness. Later plantings are likely to have a poor survival rate. The Northbend soil is poorly suited to pasture unless it is protected from flooding and wetness. Overgrazing when the soils are wet can cause surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species and increases the hazard of erosion and scouring by floodwater. Measures that improve fertility, proper stocking rates, pasture rotation, and restricted use during wet periods help to keep the pasture in good condition.

These soils are suited to trees. The equipment limitation is a management concern. Also, seedling mortality is a concern on the Absco soil. Equipment use is restricted by the flooding and the loose sand in areas of the Absco soil and by the flooding and the wetness in areas of the Northbend soil. These restrictions can be reduced by using equipment during the winter when the surface is frozen and the flooding hazard is less severe. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Log landings and haul roads are subject to repeated use by heavy equipment. These areas can be established in better suited included or adjacent areas not subject to flooding. If they are established in areas of these soils, they can be stabilized and strengthened with gravel or crushed rock. Also, culverts and ditches can be used along haul roads to maintain natural drainage systems. Competing vegetation on the Northbend soil, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or mechanical removal.

This map unit generally is not suitable as a site for septic tank absorption fields, dwellings, or local roads, mainly because of the flooding. Overcoming this limitation is difficult. A better suited site should be considered.

The land capability classification is IVw. The woodland ordination symbol is 3S (Black oak) for the Absco soil and 2W (Silver maple) for the Northbend soil. The forest habitat type commonly is PVRh for the Absco soil and ArCi for the Northbend soil.

Ad—Adder muck, 0 to 1 percent slopes

This very deep, nearly level, very poorly drained soil is in backswamps on flood plains. It is subject to ponding and to frequent flooding for long periods. Individual areas are long and narrow or irregularly shaped and generally range from 5 to 100 acres in size.

Typically, the upper part is about 22 inches of black muck. The substratum to a depth of about 60 inches is light brownish gray sand.

Included with this soil in mapping are small areas of the poorly drained Kalmarville and Newlang soils

and the very poorly drained Houghton soils. Kalmarville and Houghton soils are in positions on the landscape similar to those of the Adder soil. Kalmarville soils formed in recent loamy alluvium over sandy alluvium. Houghton soils formed in organic material more than 51 inches thick. Newlang soils are in the slightly higher positions on the landscape. They formed dominantly in siliceous sandy alluvium. Included soils make up 5 to 15 percent of the unit.

Permeability is moderately slow to moderately rapid in the organic layers of the Adder soil and rapid or very rapid in the substratum. The available water capacity and the content of organic matter are very high. The rooting depth of most crops is limited by an apparent seasonal high water table, which is near or above the surface in undrained areas.

Most areas support wetland vegetation. Because of the wetness, the frequent flooding, and the hazard of frost late in spring and early in fall, this soil is generally not suited to cultivated crops or to pasture. If drained and protected from flooding, cultivated areas are subject to burning and subsidence. Also, they are subject to soil blowing. If intensive management is applied, a few areas of this soil are suited to specialty crops.

Generally, this soil is not suited to trees. In most areas the trees grow so poorly that they are barely merchantable. In a few areas, however, there are merchantable stands of conifers. The equipment limitation, seedling mortality, and the windthrow hazard are management concerns. Overcoming these limitations is difficult. A more suitable site should be selected.

This soil generally is not suitable as a site for septic tank absorption fields, dwellings, or local roads and streets because of the subsidence, the flooding, and the ponding. Overcoming these hazards is difficult. A better suited site should be considered.

The land capability classification is Vw in undrained areas. No woodland ordination symbol or forest habitat type is assigned.

ArA—Arenzville silt loam, 0 to 3 percent slopes

This very deep, nearly level and gently sloping, moderately well drained soil is in intermittent upland drainageways and on flood plains along small perennial streams. It is occasionally flooded for brief periods. Individual areas are long and narrow and generally range from 5 to 40 acres in size.

Typically, the surface layer is dark brown silt loam about 9 inches thick. The upper part of the substratum is stratified, dark brown and brown silt loam about 23 inches thick. Below this is a buried surface layer of very dark brown silt loam about 10 inches thick. The lower part of the substratum to a depth of about 60 inches is light brownish gray, mottled silt loam that has a few thin lenses of fine sand. In some places the surface layer is very fine sandy loam. In other places the lower part of the substratum contains thin strata of sand and does not have a buried layer. In some areas the slope is more than 3 percent.

Included with this soil in mapping are small areas of the poorly drained Ettrick and somewhat poorly drained Orion soils. These soils are in the slightly lower positions on the landscape. They make up 5 to 15 percent of the unit.

Permeability is moderate in the Arenzville soil. The available water capacity is very high. The content of organic matter is moderately low or moderate in the surface layer. The surface layer is friable and can be easily tilled, but it tends to crust and puddle after hard rains or forms hard clods if it is tilled when too wet. A perched seasonal high water table is at a depth of 3.5 to 6.0 feet.

Most areas are used as cropland. A few areas are used as pasture, and very few areas are wooded. This soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, the hazard of water erosion is generally slight but some scour erosion occurs near streams. Dikes and diversions help to prevent flooding. Applying streambank stabilization measures and fencing cattle away from the streams help to prevent streambank and scour erosion. Applying a system of conservation tillage and returning crop residue to the soil or adding other organic material can help to maintain fertility and good tilth, increase the rate of water infiltration, and reduce the hazard of scouring by floodwater.

A cover of pasture plants is effective in controlling scouring by floodwater. The surface layer is subject to crusting, which restricts the emergence of plants. Overgrazing or grazing when the soil is too wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, pasture rotation, measures that improve fertility, and restricted use during wet periods help to keep the pasture in good condition.

This soil is suited to trees. Equipment use at log landings and on haul roads is restricted by the flooding and by low soil strength. These restrictions can be reduced by using equipment during dry

periods or during periods when the soil is frozen or has adequate snow cover. Log landings and haul roads can be strengthened with gravel or crushed rock. The log landings and haul roads can also be established in better suited included or adjacent areas. Competing vegetation, which interferes with tree planting and natural regeneration after trees are harvested, can be controlled by herbicides or by mechanical removal.

This soil generally is not suitable as a site for septic tank absorption fields, dwellings, or local roads and streets, mainly because of the flooding. Overcoming this limitation is difficult. A better suited site should be considered.

The land capability classification is IIw. The woodland ordination symbol is 4A (Northern red oak). The forest habitat type commonly is ArCi.

BeB—Bertrand silt loam, 1 to 6 percent slopes

This very deep, nearly level and gently sloping, well drained soil is on broad toe slopes and low knolls. Individual areas are irregular in shape and generally range from 4 to 30 acres in size.

Typically, the surface layer is dark brown silt loam about 9 inches thick. The subsoil is about 39 inches thick. It is dark yellowish brown, friable silt loam in the upper part; dark brown and brown, friable silt loam in the next part; and dark brown, friable fine sandy loam in the lower part. The substratum to a depth of about 60 inches is mostly yellow sand. In places the slope is more than 6 percent.

Included with this soil in mapping are small areas of the moderately well drained Jackson and well drained Merit soils. Jackson soils are in the slightly lower positions on the landscape. Merit soils are in positions similar to those of the Bertrand soil. They have more sand in the surface layer and subsoil than the Bertrand soil, and the depth to the sandy substratum is less than 40 inches. Included soils make up 5 to 15 percent of the unit.

Permeability is moderate in the silty subsoil of the Bertrand soil and rapid in the sandy substratum. The available water capacity is high. The content of organic matter is moderately low or moderate in the surface layer. The surface layer is friable and can be easily tilled, but it tends to crust and puddle after hard rains or forms hard clods if tilled when too wet.

Most areas are used as cropland. Very few areas are wooded. This soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, water erosion is a slight or moderate hazard. It can be controlled by terraces, grassed waterways, contour farming, contour stripcropping, and conservation tillage. Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth, increases the rate of water infiltration, and reduces the hazard of erosion.

A cover of pasture plants is effective in controlling erosion. The surface layer is subject to crusting, which restricts the emergence of plants. Overgrazing or grazing when the soil is too wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, pasture rotation, measures that improve fertility, and restricted use during wet periods help to keep the pasture in good condition.

This soil is suited to trees. Equipment use at log landings and on haul roads is restricted by low soil strength. This restriction can be reduced by using equipment during dry periods or during periods when the surface is frozen or has adequate snow cover. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be strengthened with gravel or crushed rock. The log landings and haul roads can also be established in better suited included or adjacent areas. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or mechanical removal.

Because of the restricted permeability in the subsoil, this soil is only moderately suited to septic tank absorption fields. This limitation can be overcome by constructing a filtering mound of suitable material or by increasing the size of the absorption field.

Because of the potential for shrinking and swelling, this soil is only moderately suited to dwellings. This limitation can be overcome by excavating the soil and replacing it with coarse textured material, such as sand or gravel; by strengthening the basement walls; and by installing a subsurface drainage system around the dwellings at or below the basement elevation.

Because of the low strength and the potential for frost action, this soil is poorly suited to local roads and streets. These limitations can be overcome by replacing the upper part of the soil with coarse textured base material, such as sand or gravel. The low strength can also be overcome by increasing the thickness of the pavement or base material.

The land capability classification is IIe. The woodland ordination symbol is 5A (Northern red oak). The forest habitat type commonly is ArCi.

BkA—Bilmod sandy loam, 0 to 3 percent slopes

This very deep, nearly level and gently sloping, moderately well drained soil is on toe slopes and in slight depressions and drainageways. Individual areas are irregular in shape and generally range from 5 to 70 acres in size.

Typically, the surface layer is dark brown sandy loam about 9 inches thick. The subsoil is about 23 inches thick. It is dark brown, friable sandy loam in the upper part; dark brown, friable loam in the next part; and strong brown, very friable loamy sand in the lower part. The substratum to a depth of about 60 inches is reddish yellow, mottled sand. In places the surface layer is loamy sand or fine sandy loam. In some areas the substratum has thin strata of loamy material.

Included with this soil in mapping are small areas of the well drained Bilson and moderately well drained Merimod soils. Bilson soils are in the slightly higher positions on the landscape. Merimod soils are in positions similar to those of the Bilmod soil. They have more silt and clay in the surface layer and subsoil than the Bilmod soil. Included soils make up 5 to 10 percent of the unit.

Permeability is moderate or moderately rapid in the loamy mantle in the Bilmod soil and rapid in the substratum. The available water capacity is moderate. The content of organic matter is moderately low in the surface layer. The surface layer is friable and can be easily tilled throughout a wide range in moisture content. The rooting depth of most crops is limited by the sandy substratum. An apparent seasonal high water table is at a depth of 3.5 to 6.0 feet.

Most areas are used as cropland. A few areas are used as pasture, and very few areas are wooded. This soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, water erosion is a slight or moderate hazard. Also, the soil is subject to soil blowing. Conservation tillage, winter cover crops, and field windbreaks help to prevent excessive soil loss. Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth, increases the rate of water infiltration, and helps to control erosion and soil blowing.

A cover of pasture plants is effective in controlling erosion and soil blowing. Overgrazing can cause surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, measures that improve fertility, and pasture rotation help to keep the pasture in good condition.

This soil is suited to trees. The only soil-related management concern is competing vegetation, which interferes with tree planting and natural regeneration after trees are harvested. Plant competition can be controlled by herbicides or by mechanical removal.

This soil readily absorbs the effluent in septic tank absorption fields. It does not adequately filter the effluent, however, because of the rapid permeability in the substratum. The poor filtering capacity can result in the pollution of ground water. Wetness also is a limitation. Mounding the site with suitable filtering material helps to overcome the wetness and the poor filtering capacity. Also, the effluent can be pumped to an absorption field in a nearby area of a better suited soil.

This soil is suited to dwellings without basements. Because of the wetness, however, it is only moderately suited to dwellings with basements. The wetness can be overcome by installing tile drains around the foundations and providing gravity outlets or other dependable outlets and by constructing the foundations on coarse textured fill material above the level of wetness.

Because of the potential for frost action, this soil is only moderately suited to local roads and streets. Replacing the upper part of the soil with coarse textured base material, such as sand or gravel, helps to prevent the damage caused by frost action.

The land capability classification is IIIs. The woodland ordination symbol is 4A (Northern red oak). The primary forest habitat type commonly is ArDe-V, and the secondary forest habitat type is PVCr.

BlB—Bilson sandy loam, 0 to 6 percent slopes

This very deep, nearly level and gently sloping, well drained soil is on toe slopes and low knolls. Individual areas are irregular in shape and generally range from 5 to 100 acres in size.

Typically, the surface layer is very dark brown sandy loam about 8 inches thick. The subsoil is dark yellowish brown, dark brown, and strong brown, friable sandy loam about 24 inches thick. The substratum to a depth of about 60 inches is brownish yellow sand that has a few thin strata of dark brown loamy sand. In places the surface layer is fine sandy loam or loamy sand. In some areas the slope is more than 6 percent.

Included with this soil in mapping are small areas

of the moderately well drained Bilmod, somewhat excessively drained Gosil, and well drained Merit soils. Bilmod soils are in the lower positions on the landscape. Gosil and Merit soils are in positions similar to those of the Bilson soil. Gosil soils have more sand in the surface layer and subsoil than the Bilson soil, and Merit soils have more silt and clay in the surface layer and subsoil. Included soils make up 5 to 15 percent of the unit.

Permeability is moderate or moderately rapid in the loamy mantle in the Bilson soil and rapid in the substratum. The available water capacity is moderate. The content of organic matter is moderately low in the surface layer. The surface layer is friable and can be easily tilled throughout a wide range in moisture content. The rooting depth of most crops is limited by the sandy substratum.

Most areas are used as cropland. A few areas are used as pasture, and very few areas are wooded. This soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. In most years crop yields are somewhat limited by the moderate available water capacity. If irrigated, the soil is also suited to vegetables, such as snap beans, potatoes, sweet corn, and peas. If cultivated crops are grown, water erosion is a slight or moderate hazard. Also, the soil is subject to soil blowing. Conservation tillage, winter cover crops, and field windbreaks help to prevent excessive soil loss. Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth, increases the rate of water infiltration, and helps to control erosion and soil blowing.

A cover of pasture plants is effective in controlling water erosion and soil blowing. Overgrazing can cause surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, measures that improve fertility, and pasture rotation help to keep the pasture in good condition.

This soil is suited to trees. The only soil-related management concern is competing vegetation, which interferes with tree planting and natural regeneration after trees are harvested. Plant competition can be controlled by herbicides or by mechanical removal.

This soil readily absorbs the effluent in septic tank absorption fields. It does not adequately filter the effluent, however, because of the rapid permeability in the substratum. The poor filtering capacity can result in the pollution of ground water.

This soil is suited to dwellings. It is only moderately suited to local roads and streets because of the potential for frost action. Replacing the upper part of the soil with coarse textured base material, such as sand or gravel, helps to prevent the damage caused by frost action.

The land capability classification is IIIs. The woodland ordination symbol is 4A (Northern red oak). The primary forest habitat type commonly is ArDe-V, and the secondary forest habitat type is PVCr.

BnB—Bilson-Silverhill sandy loams, 1 to 6 percent slopes

These soils are well drained and are nearly level and gently sloping. The Bilson soil is very deep. It is on low knolls and toe slopes. The Silverhill soil is deep. It is on the tops and shoulders of hills. The Bilson and Silverhill soils occur as areas so intricately mixed or so small that it was not practical to map them separately. Individual areas are irregular in shape and generally range from 10 to 200 acres in size. They are about 50 to 55 percent Bilson soil and 30 to 40 percent Silverhill soil.

Typically, the surface layer of the Bilson soil is very dark grayish brown sandy loam about 9 inches thick. The subsoil is mostly brown, friable sandy loam about 19 inches thick. The substratum to a depth of about 60 inches is yellowish brown sand that has a few thin strata of brown and strong brown sandy loam and loamy sand. In places the surface layer is fine sandy loam or loamy sand. In some areas the loamy mantle is more than 40 inches thick. In other areas the substratum is stratified sand, sandy loam, loam, and silt loam.

Typically, the surface layer of the Silverhill soil is very dark grayish brown sandy loam about 8 inches thick. The subsoil is about 24 inches thick. It is dark yellowish brown and dark brown, friable sandy loam in the upper part and strong brown, loose sand in the lower part. The upper part of the substratum is brownish yellow sand about 18 inches thick. It has a few thin strata of dark brown sandy loam. The lower part of the substratum to a depth of about 60 inches is weakly cemented sandstone. In places, the surface layer is loam and the substratum does not have loamy strata.

Included with these soils in mapping are small areas of the well drained Elevasil and Merit soils and the somewhat excessively drained Gosil soils. Also included are a few areas where the slope is more than 6 percent. Elevasil soils are in positions similar to those of the Silverhill soil. They are underlain by sandstone at a depth of less than 40 inches. Gosil and Merit soils are in positions similar to those of the

Bilson soil. They are sandy throughout. Merit soils have more clay and less sand than the major soils. Included areas make up 5 to 15 percent of the unit.

Permeability is moderate or moderately rapid in the loamy mantle in the Bilson soil and rapid in the substratum. It is moderate or moderately rapid in the loamy colluvium in the Silverhill soil, rapid in the sandy residuum, and moderately slow or moderate in the underlying sandstone. The available water capacity is moderate in both soils. The content of organic matter is moderately low in the surface layer. The surface layer of both soils is friable and can be easily tilled throughout a wide range in moisture content. The rooting depth of most crops is limited by the sandy substratum in both soils.

Most areas are used as cropland. A few areas are used as pasture, and very few areas are wooded. These soils are suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. In most years crop yields are somewhat limited by the moderate available water capacity. If irrigated, the soils are also suited to vegetables, such as snap beans, potatoes, sweet corn, and peas. If cultivated crops are grown, water erosion is a slight or moderate hazard. Also, the soils are subject to soil blowing. Conservation tillage, winter cover crops, and field windbreaks help to prevent excessive soil loss. Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth, increases the rate of water infiltration, and helps to control erosion and soil blowing.

A cover of pasture plants is effective in controlling water erosion and soil blowing. Overgrazing can cause surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, measures that improve fertility, and pasture rotation help to keep the pasture in good condition.

These soils are suited to trees. The only soil-related management concern is competing vegetation, which interferes with tree planting and natural regeneration after trees are harvested. Plant competition can be controlled by herbicides or by mechanical removal.

These soils are suited to dwellings. They readily absorb the effluent in septic absorption fields. They do not adequately filter the effluent, however, because of the rapid permeability in the substratum. The poor filtering capacity can result in the pollution of ground water. The absorption field functions better if the site is mounded with suitable filtering material.

These soils are only moderately suited to local roads and streets because of the potential for frost action. Replacing the upper part of the soil with coarse textured base material, such as sand or gravel, helps to prevent the damage caused by frost action.

The land capability classification is IIIs. The woodland ordination symbol is 4A (Northern red oak). The forest habitat type commonly is ArDe-V.

BnC2—Bilson-Elevasil sandy loams, 6 to 12 percent slopes, eroded

These soils are sloping and are well drained. The Bilson soil is very deep. It is on foot slopes and head slopes. The Elevasil soil is moderately deep. It is on nose slopes and shoulder slopes of hills. The Bilson and Elevasil soils occur as areas so intricately mixed or so small that it was not practical to map them separately. Individual areas are irregular in shape and generally range from 10 to 80 acres in size. They are about 45 to 55 percent Bilson soil and 35 to 45 percent Elevasil soil. In most cultivated areas, erosion has removed much of the original surface layer of both soils.

Typically, the surface layer of the Bilson soil is dark brown sandy loam about 9 inches thick. It is mixed with some brown subsoil material. The subsoil is mostly brown and strong brown, very friable sandy loam about 15 inches thick. The substratum to a depth of about 60 inches is yellow and brownish yellow sand that has few strata of brown and yellowish red sandy loam and loam. In places the surface layer is fine sandy loam or loamy sand. In some areas the substratum is stratified sand, sandy loam, loam, or silt loam.

Typically, the surface layer of the Elevasil soil is dark brown sandy loam about 9 inches thick. It is mixed with some brown subsoil material. The subsoil is about 18 inches thick. The upper part is brown, friable sandy loam, and the lower part is strong brown, very friable loamy sand. The upper part of the substratum is strong brown sand about 5 inches thick. The lower part to a depth of about 60 inches is weakly cemented sandstone. In places the surface layer is fine sandy loam.

Included with these soils in mapping are small areas of the well drained Council soils, the somewhat excessively drained Gosil soils, the well drained Merit soils, the moderately well drained Sebbo soils, and the well drained Silverhill soils. Also included are some areas where the slope is less than 6 percent or more than 12 percent. Council, Merit, and Gosil soils are in positions similar to those of the Bilson soil. Council soils are loamy throughout. Merit soils have

more clay and silt in the solum than the Bilson soil. Gosil soils are sandy throughout. Sebbo soils are in the lower positions on toe slopes. They are loamy throughout. Silverhill soils are in positions similar to those of the Elevasil soil. They are deep to weakly cemented sandstone. Included areas make up 5 to 15 percent of the unit.

Permeability is moderate or moderately rapid in the loamy mantle in the Bilson soil and rapid in the substratum. It is moderate or moderately rapid in the loamy colluvium in the Elevasil soil, rapid in the sandy residuum, and moderately slow or moderate in the underlying sandstone. The available water capacity is moderate in the Bilson soil and low in the Elevasil soil. The content of organic matter is moderately low in the surface layer of both soils. The surface layer is friable and can be easily tilled throughout a wide range in moisture content. The rooting depth of most crops is limited by the sandy substratum in the Bilson soil and by the underlying sandstone in the Elevasil soil.

Most areas are used as cropland. A few areas are used as pasture or woodland. These soils are suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. In most years crop yields are somewhat limited by the moderate or low available water capacity. The soils are poorly suited to irrigation because of the slope. If cultivated crops are grown, water erosion is a moderate hazard. Also, the soils are subject to soil blowing. Conservation tillage, field windbreaks, contour farming, and contour stripcropping help to prevent excessive soil loss. Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth, increases the rate of water infiltration, and helps to control erosion and soil blowing.

A cover of pasture plants is effective in controlling water erosion and soil blowing. Overgrazing can cause surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, measures that improve fertility, and pasture rotation help to keep the pasture in good condition.

These soils are suited to trees. Equipment use at log landings is restricted by the slope. Log landings can be established in nearly level or gently sloping included or adjacent areas. Competing vegetation, which interferes with tree planting and natural regeneration after trees are harvested, can be controlled by herbicides or by mechanical removal.

The Bilson soil readily absorbs the effluent in septic tank absorption fields. It does not adequately filter the effluent, however, because of the rapid permeability in the substratum. The poor filtering capacity can result in the pollution of ground water. The Elevasil soil is poorly suited to septic tank absorption fields because of the thin layer over bedrock and the poor filtering capacity. The absorption field can function adequately if the site is mounded with suitable filtering material.

Because of the slope, these soils are only moderately suited to dwellings. This limitation can be overcome by cutting and filling, by installing retaining walls, or by designing the dwellings so that one side of the basement fronts on the lower part of the slope. Also, the dwellings can be constructed in the included areas where the slope is less than 6 percent.

Because of the slope and the potential for frost action, these soils are only moderately suited to local roads and streets. The slope can be overcome by shaping the roadway through cutting and filling. Also, the roads can be built in the less sloping areas. Replacing the upper part of the soil with coarse textured base material, such as sand or gravel, helps to prevent the damage caused by frost action.

The land capability classification is IIIe. The woodland ordination symbol is 4A (Northern red oak) for the Bilson soil and 2A (Black oak) for the Elevasil soil. The forest habitat type commonly is ArDe-V for the Bilson soil and PVCr for the Elevasil soil.

BnD2—Bilson-Elevasil sandy loams, 12 to 20 percent slopes, eroded

These soils are moderately steep and are well drained. The Bilson soil is very deep. It is on foot slopes and head slopes. The Elevasil soil is moderately deep. It is on nose slopes, shoulder slopes, and back slopes of hills. The Bilson and Elevasil soils occur as areas so intricately mixed or so small that it was not practical to map them separately. Individual areas are irregular in shape and generally range from 10 to 80 acres in size. They are about 45 to 55 percent Bilson soil and 30 to 40 percent Elevasil soil. In most cultivated areas, erosion has removed much of the original surface layer of both soils.

Typically, the surface layer of the Bilson soil is dark brown sandy loam about 9 inches thick. It is mixed with some brown subsoil material. The subsoil is about 30 inches thick. It is brown and friable. The upper part is sandy loam, and the lower part is loamy sand. The substratum to a depth of about 60 inches is yellowish brown sand that has few strata of strong brown and reddish brown sandy loam and loam. In

places the surface layer is fine sandy loam or loamy sand. In some areas the substratum does not have loamy strata.

Typically, the surface layer of the Elevasil soil is dark brown sandy loam about 9 inches thick. It is mixed with some brown subsoil material. The subsoil is about 17 inches thick. The upper part is brown, friable sandy loam, and the lower part is strong brown, very friable loamy sand. The upper part of the substratum is strong brown sand about 4 inches thick. The lower part to a depth of about 60 inches is weakly cemented sandstone. In places the surface layer is fine sandy loam.

Included with these soils in mapping are small areas of the well drained Council, Merit, Silverhill, and Seaton soils. Also included are some areas where the slope is less than 6 percent or more than 12 percent. Council and Merit soils are in positions similar to those of the Bilson soil. Council soils are loamy throughout and are very deep to sandstone. Merit soils have more clay and silt in the solum than the Bilson soil. Silverhill and Seaton soils are in positions similar to those of the Elevasil soil. Silverhill soils are deep to weakly cemented sandstone. Seaton soils have more silt and clay in the solum than the Elevasil soil. Also, they are very deep. Included areas make up 5 to 15 percent of the unit.

Permeability is moderate or moderately rapid in the loamy mantle in the Bilson soil and rapid in the substratum. It is moderate or moderately rapid in the loamy mantle in the Elevasil soil, rapid in the sandy part of the subsoil and in the substratum, and moderately slow or moderate in the underlying sandstone. The available water capacity is moderate in the Bilson soil and low in the Elevasil soil. The content of organic matter is moderately low in the surface layer of both soils. The surface layer of both soils is friable and can be easily tilled throughout a wide range in moisture content. The rooting depth of most crops is limited by the sandy substratum in the Bilson soil and by the underlying sandstone in the Elevasil soil.

Most areas are used as cropland. A few areas are used as pasture or woodland. These soils are suited to corn and small grain and to grasses and legumes for hay and pasture. In most years crop yields are somewhat limited by the moderate or low available water capacity. The soils are not suited to irrigation because of the slope. If cultivated crops are grown, water erosion is a severe hazard. Also, the soils are subject to soil blowing. Contour farming, contour stripcropping, crop rotations that include grasses and legumes, and conservation tillage help to prevent excessive soil loss. Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth, increases the rate of water infiltration, and helps to control erosion and soil blowing.

A cover of pasture plants is effective in controlling erosion and soil blowing. Overgrazing can cause surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, pasture rotation, and measures that improve fertility help to keep the pasture in good condition.

These soils are suited to most trees. The erosion hazard and the equipment limitation are management concerns. Erosion is accelerated where runoff is concentrated on skid trails, log landings, and haul roads. Removing water with water bars, establishing out-sloping road surfaces, crowning the road surfaces, providing ditches and culverts, and establishing skid trails and haul roads on the contour minimize erosion. Erosion can also be controlled by seeding areas where logging activities have exposed the surface.

Equipment use is restricted by the slope. Skid trails and haul roads can be designed so that they conform to the topography and so that grades are kept as low as possible. Log landings can be established in nearly level or gently sloping included or adjacent areas. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or mechanical removal.

Because of the poor filtering material and the slope, the Bilson soil is poorly suited to septic tank absorption fields. This soil readily absorbs but does not adequately filter the effluent. The poor filtering capacity can result in the pollution of ground water. The slope can be overcome by installing a trench absorption system on the contour or in included or adjacent areas that have slopes of less than 6 percent. Because of the thin layer over bedrock, a poor filtering capacity, and the slope, the Elevasil soil generally is not suitable as a site for septic tank absorption fields.

Because of the slope, these soils are poorly suited to dwellings. This limitation can be overcome by cutting and filling, by installing retaining walls, or by designing the dwellings so that one side of the basement fronts on the lower part of the slope. Also, the dwellings can be constructed in the included areas where the slope is less than 6 percent.

Because of the slope, these soils are poorly suited to local roads and streets. This limitation can be overcome by shaping the roadway through cutting

and filling. Also, the roads can be built in the less sloping included areas.

The land capability classification is IVe. The woodland ordination symbol is 4R (Northern red oak) for the Bilson soil and 2R (Black oak) for the Elevasil soil. The forest habitat type commonly is ArDe-V for the Bilson soil and PVCr for the Elevasil soil.

BoB—Boone sand, 2 to 6 percent slopes

This moderately deep, gently sloping, excessively drained soil is on low knolls and summits of narrow ridges and hills. Individual areas are long and narrow and generally range from 4 to 60 acres in size.

Typically, the surface layer is dark brown sand about 8 inches thick. The subsoil is strong brown and dark yellowish brown sand about 14 inches thick. The upper part of the substratum is yellowish brown sand about 16 inches thick. The lower part to a depth of about 60 inches is weakly cemented sandstone. In places the surface layer is loamy sand or fine sand. In some areas the substratum has thin strata of loamy material. In other areas the slope is more than 6 percent.

Included with this soil in mapping are small areas of the somewhat excessively drained Elevasil and excessively drained Tarr soils. Elevasil soils are in positions on the landscape similar to those of the Boone soil. They have more silt and clay in the surface layer and subsoil than the Boone soil. Tarr soils are in the lower positions on the landscape. They are underlain by sand to a depth of 60 inches or more. Included soils make up 10 to 15 percent of the unit.

Permeability is rapid in the sandy subsoil and substratum of the Boone soil and moderately slow or moderate in the underlying sandstone. The available water capacity is low. The content of organic matter is very low or low in the surface layer. The surface layer is very friable and can be easily tilled throughout a wide range in moisture content. The rooting depth of most crops is limited by the underlying sandstone.

Most areas are used as cropland. Some areas are planted to pine trees, and a few areas are used as pasture. This soil is poorly suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. In most years crop yields are limited by the low available water capacity. If irrigated, the soil is suited to the commonly grown farm crops and to vegetables, such as snap beans and sweet corn. If cultivated crops are grown, water erosion is a slight hazard. Also, the soil is subject to soil blowing. Winter cover crops, conservation tillage, wind stripcropping, and field windbreaks help to prevent excessive soil loss. Returning crop residue to the soil or adding other organic material reduces the amount of water lost through evaporation, helps to maintain fertility and good tilth, and reduces the hazard of soil blowing.

A cover of pasture plants is effective in controlling soil blowing and water erosion. Forage yields are generally low unless fertilizer is applied and the supply of moisture is adequate. Planting early in spring, before the soil has a chance to dry, helps to overcome the droughtiness. Later plantings are likely to have a poor survival rate. Overgrazing can cause surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Measures that improve fertility, proper stocking rates, and pasture rotation help to keep the pasture in good condition.

This soil is poorly suited to hardwood trees, which grow slowly and are poorly shaped. It is better suited to pine trees. The equipment limitation and seedling mortality are management concerns. Equipment use is restricted by the loose sand. This restriction can be reduced by using equipment when the surface is frozen. Equipment with flotation tires or with tracks has better traction in loose sand than standard wheeled equipment. Sandy areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be stabilized with gravel or crushed rock. The log landings and haul roads can also be established in better suited included or adjacent areas. Seedling mortality caused by droughtiness can be reduced by careful planting of containerized seedlings or vigorous nursery stock. It can also be reduced by planting when the soil is moist. Although production of merchantable hardwood trees on this soil may not be profitable, the use of trees to control soil blowing and water erosion can be very effective.

This soil is suited to dwellings and local roads and streets. Because of a thin layer over bedrock and a poor filtering capacity, the soil is poorly suited to septic tank absorption fields. These limitations can result in the pollution of ground water. Mounding the site with suitable filtering material helps to overcome the limitations. Also, the effluent can be pumped to an absorption field on a better suited soil in a nearby area.

The land capability classification is IVs. The woodland ordination symbol is 2A (Black oak). The primary forest habitat type commonly is PVGy, and the secondary forest habitat type is PVCr.

BoC—Boone sand, 6 to 15 percent slopes

This moderately deep, sloping and moderately steep, excessively drained soil is on the summits, shoulders, and back slopes of ridges, knolls, and hills. Individual areas are long or irregularly shaped and generally range from 5 to 200 acres in size.

Typically, the surface layer is very dark gray sand about 2 inches thick. It is covered by about 2 inches of partially decomposed leaf and grass litter. The subsoil is dark brown and yellowish brown sand about 19 inches thick. The upper part of the substratum is brownish yellow sand about 15 inches thick. The lower part to a depth of about 60 inches is weakly cemented sandstone. In places the surface layer is loamy sand or fine sand. In some areas the slope is less than 6 percent or more than 12 percent.

Included with this soil in mapping are small areas of the well drained Elevasil and excessively drained Tarr soils. Elevasil soils are in positions on the landscape similar to those of the Boone soil. They have more silt and clay in the surface layer and subsoil than the Boone soil. Tarr soils are in the lower positions on foot slopes. They are very deep. Included soils make up 10 to 15 percent of the unit.

Permeability is rapid in the sandy subsoil and substratum of the Boone soil and moderately slow or moderate in the underlying sandstone. The available water capacity is very low. The content of organic matter is very low or low in the surface layer. The surface layer is very friable and can be easily tilled throughout a wide range in moisture content. The rooting depth of most crops is limited by the underlying sandstone.

Most areas are wooded. A few areas have been planted to pine. This soil is generally unsuited to corn, soybeans, and small grain and is poorly suited to grasses and legumes for hay, mainly because of droughtiness, water erosion, and soil blowing.

A cover of pasture plants is effective in controlling soil blowing and water erosion. Forage yields are generally low unless fertilizer is applied and the supply of moisture is adequate. Planting early in spring, before the soil has a chance to dry, helps to overcome the droughtiness. Later plantings are likely to have a poor survival rate. Overgrazing can cause surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Measures that improve fertility, proper stocking rates, and pasture rotation help to keep the pasture in good condition.

This soil is poorly suited to hardwood trees, which grow slowly and are poorly shaped. It is better suited to pine trees. The equipment limitation and seedling mortality are management concerns. Equipment use is restricted by the loose sand and by the slope at log landings. The loose sand can be overcome by using equipment only when the surface is frozen. Equipment with flotation tires or with tracks has better traction in loose sand than standard wheeled equipment. Sandy areas that are subject to repeated use by heavy equipment, such as log landings and haul roads, can be stabilized with gravel or crushed rock. The log landings and haul roads can also be established in areas of better suited soils, such as included or adjacent nearly level or gently sloping areas. Seedling mortality caused by droughtiness can be reduced by careful planting of containerized seedlings or vigorous nursery stock. It can also be reduced by planting when the soil is moist. Although production of merchantable hardwood trees on this soil may not be profitable, the use of trees to control soil blowing and water erosion can be very effective.

Because of a thin layer over bedrock and a poor filtering capacity, this soil is poorly suited to use as a site for septic tank absorption fields. These limitations can result in the pollution of ground water. Mounding the site with suitable filtering material helps to overcome the limitations. Also, the effluent can be pumped to an absorption field on a better suited soil in a nearby area.

Because of the slope, this soil is only moderately suited to dwellings. This limitation can be overcome by cutting and filling, installing retaining walls, or by designing the dwellings so that one side of the basement fronts on the lower part of the slope. Also, the dwellings can be constructed in the included areas where the slope is less than 6 percent.

Because of the slope, this soil is only moderately suited to local roads and streets. This limitation can be overcome by shaping the roadway through cutting and filling.

The land capability classification is VIs. The woodland ordination symbol is 2A (Black oak). The primary forest habitat type commonly is PVGy, and the secondary forest habitat type is PVCr.

BoF—Boone sand, 15 to 50 percent slopes

This moderately deep, moderately steep to very steep, excessively drained soil is on shoulders, nose slopes, and back slopes of hills. Individual areas are long and narrow or irregularly shaped and range from 10 to 300 acres in size.

Typically, the surface layer is dark brown sand about 3 inches thick. The subsoil is yellowish brown,

loose sand about 15 inches thick. The upper part of the substratum is yellow sand about 12 inches thick. The lower part to a depth of about 60 inches is weakly cemented sandstone. In some places the surface layer is loamy sand or fine sand.

Included with this soil in mapping are small areas of the excessively drained Tarr soils. These soils are in the lower positions on foot slopes. They are very deep.

Permeability is rapid in the sandy subsoil and substratum of the Boone soil and moderately slow or moderate in the underlying sandstone. The available water capacity is very low. The content of organic matter is very low or low in the surface layer. The rooting depth of most plants is limited by the underlying sandstone.

Most areas are wooded. Because of the severe hazard of erosion, the hazard of soil blowing, and droughtiness, this soil is not suited to cultivated crops and is poorly suited to pasture. Using machinery on the steep and very steep slopes is difficult. In some of the less sloping areas, pasture can be renovated and improved. The native vegetation generally is of poor quality for forage. The soil is poorly suited to hardwood trees, which grow slowly and are poorly shaped. It is better suited to pine trees. The erosion hazard, equipment limitations, and seedling mortality are management concerns.

Erosion is accelerated where runoff is concentrated on skid trails, log landings, and haul roads. Removing water with water bars, establishing out-sloping road surfaces, crowning the road surfaces, providing culverts and ditches, and establishing skid trails and haul roads on the contour help to control erosion. Erosion also can be controlled by seeding areas where logging has exposed the soil surface.

Equipment use is severely restricted by the slope. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Skid trails and haul roads can be designed so that they conform to the topography and so that grades are kept as low as possible. In very steep areas, it may be necessary to yard the logs by cable. Log landings can be established in included or adjacent areas that are nearly level or gently sloping. Seedling mortality caused by droughtiness can be reduced by careful planting of containerized seedlings or vigorous nursery stock. It can also be reduced by planting when the soil is moist. Although production of merchantable hardwood trees on this soil may not be profitable, the use of trees to control soil blowing and water erosion is very effective.

This soil is generally not suitable as a site for septic tank absorption fields because of the slope and the depth to bedrock. It is generally not suitable for dwellings or for local roads and streets because of the slope. Overcoming these limitations is difficult. It may be possible to use some of the small, less sloping included areas for dwellings or for roads and streets; generally, however, a better suited site should be considered.

The land capability classification is VIIs. The woodland ordination symbol is 2R (Black oak). The forest habitat type is commonly PVGy.

BpF—Boone-Elevasil complex, 15 to 50 percent slopes

These soils are moderately deep. The excessively drained Boone soil is in steep and very steep positions, such as shoulder slopes, nose slopes, and back slopes of hills. The well drained Elevasil soil is in moderately steep and steep positions, such as summits, shoulders, and the lower part of back slopes and the upper part of foot slopes on hills and ridges. The Boone and Elevasil soils occur as areas so intricately mixed or so small that it was not practical to map them separately. Individual areas are long and narrow or irregularly shaped and generally range from 10 to 1,000 acres in size. They are about 40 to 50 percent Boone soil and 30 to 45 percent Elevasil soil.

Typically, the surface layer of the Boone soil is very dark grayish brown sand about 2 inches thick. It is covered by about 1 inch of dark grayish brown mucky peat, which is a mat of partially decomposed forest litter. The subsurface layer is brown sand about 5 inches thick. The subsoil is dark yellowish brown, very friable sand about 13 inches thick. The upper part of the substratum is brownish yellow sand about 14 inches thick. The lower part to a depth of about 61 inches is weakly cemented sandstone. In places the surface layer is loamy sand or fine sand. In some areas the sandstone is glauconitic.

Typically, the surface layer of the Elevasil soil is very dark brown sandy loam about 2 inches thick. It is covered by about 1 inch of very dark grayish brown mucky peat, which is a mat of partially decomposed forest litter. The subsoil is about 28 inches thick. It is dark yellowish brown and strong brown, friable sandy loam in the upper part and strong brown, very friable loamy sand in the lower part. The upper part of the substratum is reddish yellow sand about 8 inches thick. The lower part to a depth of about 60 inches is weakly cemented sandstone. In places the sandstone is fine grained

and glauconitic. In some areas the surface layer is fine sandy loam.

Included with these soils in mapping are small areas of the well drained Council soils, the moderately well drained Sebbo soils, and the excessively drained Tarr soils. Council soils are in landscape positions similar to those of the Elevasil soil. They are loamy throughout and are very deep. Sebbo soils are on toe slopes, and Tarr soils are on foot slopes. Sebbo soils are loamy throughout and are very deep. Included soils make up 10 to 20 percent of the unit.

Permeability is rapid in the sandy subsoil and substratum of the Boone soil and moderately slow or moderate in the underlying sandstone. It is moderate or moderately rapid in the loamy mantle in the Elevasil soil, rapid in the sandy part of the subsoil and substratum, and moderately slow or moderate in the underlying sandstone. The available water capacity is very low in the Boone soil and low in the Elevasil soil. The content of organic matter in the surface layer of the Boone soil is very low or low. It is moderately low in the surface layer of the Elevasil soil. The rooting depth of most plants is limited by the underlying sandstone in both soils.

Most areas are wooded. Because of a severe hazard of erosion, droughtiness, and the hazard of soil blowing, these soils are not suited to cultivated crops and are poorly suited to pasture. Using machinery on the steep and very steep slopes is difficult. In some of the less sloping areas, the pasture can be renovated and improved. The native vegetation generally is of poor quality for forage.

These soils are poorly suited to hardwood trees, which grow slowly and are poorly shaped (fig. 9). They are better suited to pine trees. The erosion hazard and the equipment limitation are management concerns. Seedling mortality is an additional concern on the Boone soil.

Erosion is accelerated where runoff is concentrated on skid trails, log landings, and haul roads. Removing water with water bars, establishing out-sloping road surfaces, crowning the road surfaces, providing culverts and ditches, and establishing skid trails and haul roads on the contour help to control erosion. Erosion also can be controlled by seeding areas where logging has exposed the soil surface.

Equipment use is severely restricted by the slope. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Skid trails and haul roads can be designed so that they conform to the topography and so that grades are kept as low as possible. In very steep areas, it may be necessary to yard the logs by cable. Log landings can be established in included or adjacent areas that are nearly level or gently sloping. In areas of the Boone soil, seedling mortality caused by droughtiness can be reduced by careful planting of containerized seedlings or vigorous nursery stock. It can also be reduced by planting when the soil is moist. Although production of merchantable hardwood trees on the Boone soil may not be profitable, the use of trees to control soil blowing and water erosion can be very effective. In areas of the Elevasil soil, competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or mechanical removal.

These soils generally are not suitable as sites for septic tank absorption fields, dwellings, or local roads and streets, mainly because of the slope. Overcoming this limitation is difficult. It may be possible to use some of the small, less sloping included areas for these uses; generally, however, a better suited site should be considered.

The land capability classification is VIIe. The woodland ordination symbol is 2R (Black oak) for both soils. The forest habitat type commonly is PVGy for the Boone soil and PVCr for the Elevasil soil.

Cd—Citypoint mucky peat, 0 to 1 percent slopes

This moderately deep or deep, nearly level, very poorly drained soil is in drainageways and depressions. It is subject to ponding. Individual areas are oblong or irregularly shaped and generally range from 20 to 300 acres in size.

Typically, the organic layers are about 26 inches thick. The upper part is dark reddish brown mucky peat, and the lower part is dark reddish brown and black muck. The upper part of the substratum is light brownish gray fine sand about 8 inches thick. The lower part to a depth of about 60 inches is weakly cemented interbedded sandstone and shale. In places sand extends to a depth of 60 inches or more.

Included with this soil in mapping are small areas of the very poorly drained Loxley and poorly drained Ponycreek soils. Loxley soils are in positions on the landscape similar to those of the Citypoint soil. They have organic material throughout. Ponycreek soils are in the slightly higher positions. They are mostly sandy throughout. Included soils make up 5 to 15 percent of the unit.

Permeability is moderately slow to moderately rapid in the organic material in the Citypoint soil. It is

Figure 9.—A stand of pin oak in an area of Boone-Elevasil complex, 15 to 50 percent slopes. Because these soils are droughty, hardwood trees grow slowly and tend to be poorly shaped.

slow to rapid in the substratum and extremely slow to moderately slow in the underlying interbedded sandstone and shale. The available water capacity and the content of organic matter are very high. The rooting depth of most plants is limited by a perched seasonal high water table, which is near or above the surface in undrained areas.

Most areas support wetland vegetation. Because of the wetness, a scarcity of suitable drainage outlets, and an extremely acid reaction, this soil is generally not suited to cultivated crops or pasture. If drained, cultivated areas are subject to burning and subsidence. Also, they are subject to soil blowing. If intensive management is applied, some areas of this soil are suited to cranberries and other specialty crops.

Generally, this soil is not suited to trees. In most areas trees grow so poorly that they are barely merchantable at best. A few areas support merchantable stands of conifers. The equipment limitation, seedling mortality, and the windthrow hazard are management concerns. Because overcoming these limitations is difficult, a more suitable site should be selected.

This soil generally is not suitable as a site for septic tank absorption fields, dwellings, or local

roads and streets, mainly because of the subsidence and the ponding. Overcoming these limitations is difficult. A better suited site should be considered.

The land capability classification is VIIw in undrained areas. The woodland ordination symbol is 2W (Black spruce). No forest habitat type is assigned.

CfA—Coffton silt loam, 0 to 3 percent slopes

This very deep, nearly level and gently sloping, somewhat poorly drained soil is on flood plains along perennial and intermittent streams. It is subject to occasional flooding for brief periods. Individual areas are long and narrow and generally range from 5 to 20 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 8 inches thick. The subsurface layer is very dark gray silt loam about 3 inches thick. The subsoil is grayish brown and dark grayish brown, mottled, friable silt loam about 27 inches thick. The substratum to a depth of about 60 inches is olive gray, mottled silt loam that has thin strata of fine sandy loam. In some places the surface layer is thinner or lighter in color. In other places sand, sandy loam, or loam is at a depth of more than 40 inches.

Included with this soil in mapping are small areas of the moderately well drained Arenzville and poorly drained Ettrick soils. Arenzville soils are in the higher positions on the landscape. Ettrick soils are in the lower positions. Included soils make up 10 to 20 percent of the unit.

Permeability is moderate in the Coffton soil. The available water capacity is very high. The content of organic matter is moderate in the surface layer. The surface layer is friable and can be easily tilled, but it tends to crust and puddle after hard rains or forms hard clods if tilled when too wet. The rooting depth of most crops is limited during wet periods of the growing season by the apparent seasonal high water table, which is at a depth of 1 to 2 feet in undrained areas.

Most areas are used as cropland. A few areas are used as pasture or are wooded. If drained and protected from flooding, this soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Dikes and diversions help to prevent flooding. Land smoothing, diversions, and interception subsurface drains help to remove excess water. Restrictive soil layers may limit the movement of water to tile drains. Applying a system of conservation tillage and returning crop residue to the soil or adding other organic material can help to maintain fertility and good tilth, increase the rate of water infiltration, and reduce the hazard of scouring by floodwater.

A cover of pasture plants is effective in controlling scouring by floodwater. The surface layer is subject to crusting, which restricts the emergence of plants. Alfalfa is generally short lived because of the seasonal high water table, flooding, and winterkill resulting from frost heave. Red clover is generally grown. Overgrazing or grazing when the soil is wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, measures that improve fertility, pasture rotation, and restricted use during wet periods help to keep the pasture in good condition.

This soil is suited to trees. The use of equipment is restricted by the wetness, the flooding, and low soil strength. These restrictions can be reduced by using equipment during dry periods or during periods when the surface is frozen or has adequate snow cover. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be strengthened with gravel or crushed rock. The log landings and haul roads can also be established in better suited included or adjacent areas. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or mechanical removal.

This soil generally is not suitable as a site for septic tank absorption fields or dwellings, mainly because of the flooding and the wetness. Overcoming these limitations is difficult. A better suited site should be considered.

This soil is poorly suited to local roads and streets because of the flooding and the potential for frost action. Replacing the upper part of the soil with coarse textured base material, such as sand or gravel, helps to prevent the damage caused by frost action.

The land capability classification is IIw. The woodland ordination symbol is 2W (Silver maple). The forest habitat type commonly is ArCi.

CoC2—Council loam, 6 to 12 percent slopes, eroded

This very deep, sloping, well drained soil is on back slopes, head slopes, and foot slopes of hills. Individual areas are irregular in shape and generally range from 5 to 100 acres in size. The mottles in the lower part of the subsoil and the substratum are relict and are not associated with a seasonal high water table.

In most cultivated areas much of the original surface layer has been lost through erosion. Typically, the remaining surface layer is dark brown loam about 8 inches thick. It is mixed with some brown subsoil material. The subsoil is about 28 inches thick. It is dark brown, friable loam in the upper part and yellowish brown, very friable fine sandy loam in the lower part. The substratum to a depth of about 60 inches is yellowish brown, mottled silt loam. In places the surface layer is silt loam or sandy loam. In some areas the slope is less than 6 percent or more than 12 percent.

Included with this soil in mapping are small areas of the well drained Gale and Seaton soils and the moderately well drained Sebbo soils. Sebbo soils are in the lower positions on the landscape. Gale and Seaton soils are in landscape positions similar to those of the Council soil. Gale soils are underlain by sandstone at a depth of 20 to 40 inches. Seaton soils are silty throughout. Sebbo soils are on toe slopes. They have a perched water table. They contain more clay and less silt than the Council soil. Included soils make up 5 to 10 percent of the unit.

Permeability is moderate in the Council soil. The available water capacity is high. The content of organic matter is moderately low in the surface layer. The surface layer is friable and can be easily tilled, but it tends to crust and puddle after hard rains or forms hard clods if tilled when too wet.

Most areas are used as cropland. A few areas are used for pasture, and very few areas are wooded. This soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, water erosion is a moderate hazard. It can be controlled by terraces, contour farming, contour stripcropping, grassed waterways, and conservation tillage. Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth, increases the rate of water infiltration, and reduces the hazard of erosion.

A cover of pasture plants is effective in controlling water erosion. The surface layer is subject to crusting, which restricts the emergence of plants. Overgrazing or grazing when the soil is too wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, pasture rotation, measures that improve fertility, and restricted use during wet periods help to keep the pasture in good condition.

This soil is suited to trees. Equipment use at log landings is restricted by the slope. Log landings can be established in nearly level or gently sloping included or adjacent areas. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or mechanical removal.

Because of the slope, this soil is only moderately suited to septic tank absorption fields. The slope can be overcome by installing a trench absorption system on the contour. Also, the less sloping included areas can be used.

Because of the slope, this soil is only moderately suited to dwellings. This limitation can be overcome by cutting and filling, by installing retaining walls, or by designing the dwellings so that one side of the basement fronts on the lower part of the slope. Also, the dwellings can be constructed in areas of included soils that have slopes of less than 6 percent.

Because of the slope and the potential for frost action, this soil is only moderately suited to local roads and streets. The slope can be overcome by shaping the roadway through cutting and filling. Also, the roads can be built in the less sloping areas. Replacing the upper part of the soil with a coarse textured base material, such as sand or gravel, helps to prevent the damage caused by frost action.

The land capability classification is IIIe. The woodland ordination symbol is 4A (Northern red oak). The primary forest habitat type commonly is ArCi, and the secondary forest habitat type is ArDe-V.

CpC2—Council-Bilson fine sandy loams, 6 to 12 percent slopes, eroded

These very deep soils are sloping and well drained. They are on foot slopes and head slopes. The Council and Bilson soils occur as areas so intricately mixed or so small that it was not practical to map them separately. Individual areas generally are oblong and range from 5 to 60 acres in size. They are about 40 to 50 percent Council soil and 35 to 45 percent Bilson soil. The mottles in the lower part of the subsoil and the substratum of the Council soil are relict and are not associated with a seasonal high water table. In most cultivated areas, erosion has removed much of the original surface layer of both soils.

Typically, the surface layer of the Council soil is dark brown fine sandy loam about 9 inches thick. It is mixed with some yellowish brown subsoil material. The subsoil is about 32 inches thick. It is friable. The upper part is dark yellowish brown fine sandy loam, the next part is dark yellowish brown loam, and the lower part is light yellowish brown, mottled sandy loam. The substratum to a depth of about 60 inches is

stratified, brownish yellow, mottled silt loam and loam. In places the surface layer is sandy loam or silt loam.

Typically, the surface layer of the Bilson soil is very dark grayish brown fine sandy loam about 8 inches thick. It is mixed with some yellowish brown subsoil material. The subsoil is about 22 inches thick. It is mostly dark yellowish brown and friable. The upper part is fine sandy loam, the next part is sandy loam, and the lower part is loamy sand. The substratum to a depth of about 60 inches is brownish yellow and very pale brown sand. In places the surface layer is sandy loam or loam. In some areas the substratum has strata of sandy loam or loam.

Included with these soils in mapping are small areas of the well drained Elevasil and Seaton soils and the moderately well drained Sebbo soils. Also included are some areas where the slope is less than 6 percent or more than 12 percent. Elevasil soils are in the slightly higher positions on the landscape. They are underlain by sandstone at a depth of 20 to 40 inches. Seaton soils are in positions similar to those of the Council soil. They are silty throughout. Sebbo soils are on toe slopes. They have a perched water table. They have more clay and less silt than the major soils. Included areas make up 5 to 15 percent of the unit.

Permeability is moderate in the Council soil. It is moderate or moderately rapid in the loamy mantle in the Bilson soil and rapid in the substratum. The available water capacity is high in the Council soil and moderate in the Bilson soil. The content of organic matter is moderately low in the surface layer of both soils. The surface layer is friable and can be easily tilled throughout a wide range in moisture content. The rooting depth of most crops is limited in areas of the Bilson soil by the sandy substratum.

Most areas are used as cropland or pasture. A few areas are wooded. These soils are suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, water erosion is a moderate hazard. The soils are also subject to soil blowing. Grassed waterways, contour farming, contour stripcropping, field windbreaks, and conservation tillage help to prevent excessive soil loss. Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth, increases the rate of water infiltration, and helps to control erosion and soil blowing.

A cover of pasture plants is effective in controlling erosion and soil blowing. Overgrazing can cause surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, pasture rotation, and measures that improve fertility help to keep the pasture in good condition.

These soils are suited to trees. Equipment use at log landings is restricted by the slope. Log landings can be established in nearly level and gently sloping included or adjacent areas. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal.

Because of the slope, the Council soil is only moderately suited to septic tank absorption fields. The slope can be overcome by installing a trench absorption system on the contour. Also, the less sloping included areas may be used. The Bilson soil readily absorbs the effluent in septic tank absorption fields. It does not adequately filter the effluent, however, because of the rapid permeability in the substratum. The poor filtering capacity can result in the pollution of ground water. The absorption field functions better if the site is mounded with suitable filtering material.

Because of the slope, these soils are only moderately suited to dwellings. This limitation can be overcome by cutting and filling, by installing retaining walls, or by designing the dwellings so that one side of the basement fronts on the lower part of the slope. Also, the dwellings can be constructed in the included areas where the slope is less than 6 percent.

Because of the slope and the potential for frost action, these soils are only moderately suited to local roads and streets. The slope can be overcome by shaping the roadway through cutting and filling or by building the road in the less sloping areas. Replacing the upper part of the soil with a coarse textured base material, such as sand or gravel, helps to prevent the damage caused by frost action.

The land capability classification is IIIe. The woodland ordination symbol is 4A (Northern red oak). The forest habitat type commonly is ArCi for the Council soil and ArDe-V for the Bilson soil.

CpD2—Council-Bilson fine sandy loams, 12 to 20 percent slopes, eroded

These soils are very deep, moderately steep, and well drained. They are on foot slopes and head slopes. The Council and Bilson soils occur as areas so intricately mixed or so small that it was not practical to map them separately. Individual areas generally are oblong and range from 5 to 60 acres in size. They are about 40 to 50 percent Council soil and 35 to 45 percent Bilson soil. The mottles in the

substratum of the Council soil are relict and are not associated with a seasonal high water table. In most cultivated areas, erosion has removed much of the original surface layer of both soils.

Typically, the surface layer of the Council soil is dark brown fine sandy loam about 8 inches thick. It is mixed with some brown subsoil material. The subsoil is about 30 inches thick. It is brown, very friable fine sandy loam in the upper part and pale brown, very friable sandy loam in the lower part. The substratum to a depth of about 60 inches is stratified, pale brown, mottled silt loam and loam. In places the surface layer is sandy loam or silt loam.

Typically, the surface layer of the Bilson soil is very dark grayish brown fine sandy loam about 8 inches thick. It is mixed with some yellowish brown subsoil material. The subsoil is about 23 inches thick. It is very friable. The upper part is dark yellowish brown fine sandy loam, the next part is dark yellowish brown sandy loam, and the lower part is yellowish brown loamy sand. The substratum to a depth of about 60 inches is brownish yellow sand. In some places the surface layer is sandy loam or loam. In other places the substratum has strata of sandy loam or loam.

Included with these soils in mapping are small areas of the well drained Elevasil and Seaton soils and the moderately well drained Sebbo soils. Also included are some areas where the slope is less than 12 percent or more than 20 percent. Elevasil soils are in the slightly higher positions on the landscape. They are underlain by sandstone at a depth of 20 to 40 inches. Seaton soils are in positions similar to those of the Bilson soil. They are silty throughout. Sebbo soils are on toe slopes. They have a perched water table. They have more clay and less silt than the major soils. Included areas make up 5 to 15 percent of the unit.

Permeability is moderate in the Council soil. It is moderate or moderately rapid in the loamy mantle in the Bilson soil and rapid in the substratum. The available water capacity is high in the Council soil and moderate in the Bilson soil. The content of organic matter is moderately low in the surface layer of both soils. The surface layer is friable and can be easily tilled throughout a wide range in moisture content. The rooting depth of most crops is limited in areas of the Bilson soil by the sandy substratum.

Most areas are used as cropland or pasture. Some extensive areas are wooded. These soils are suited to corn and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, water erosion is a severe hazard. The soils are also subject to soil blowing. Contour farming, contour stripcropping, field windbreaks, crop rotations that include grasses and legumes, and conservation tillage help to prevent excessive soil loss. Returning crop residue or adding other organic material to the soil helps to maintain fertility and good tilth, increases the rate of infiltration, and helps to control erosion and soil blowing.

A cover of pasture plants is effective in controlling erosion and soil blowing. Overgrazing can cause surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, pasture rotation, and measures that improve fertility help to keep the pasture in good condition.

These soils are suited to trees. The erosion hazard and the equipment limitation are management concerns. Erosion is accelerated where runoff is concentrated on skid trails, log landings, and haul roads. Removing water with water bars, establishing out-sloping road surfaces, crowning the road surfaces, providing ditches and culverts, and establishing skid trails and haul roads on the contour minimize erosion. Erosion also can be controlled by seeding areas where logging has exposed the surface.

Equipment use is restricted by the slope. Skid trails and haul roads can be designed so that they conform to the topography and so that grades are kept as low as possible. Log landings can be established in nearly level or gently sloping included or adjacent areas. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or mechanical removal.

Because of the slope, the Council soil is poorly suited to septic tank absorption fields. This limitation can be overcome by installing a trench absorption system on the contour. Also, included areas where the slope is less than 6 percent may possibly be used. Because of the poor filtering material and the slope, the Bilson soil is poorly suited to septic tank absorption fields. It readily absorbs but does not adequately filter the effluent. The poor filtering capacity can result in the pollution of ground water. The slope can be overcome by installing a trench absorption system on the contour or in included or adjacent areas that have slopes of less than 6 percent.

Because of the slope, these soils are poorly suited to dwellings. This limitation can be overcome by cutting and filling, by installing retaining walls, or by designing the dwellings so that one side of the

basement fronts on the lower part of the slope. Also, the dwellings can be constructed in included areas where the slope is less than 6 percent.

Because of the slope, these soils are poorly suited to local roads and streets. This limitation can be overcome by shaping the roadway through cutting and filling or by building the road in the less sloping areas.

The land capability classification is IVe. The woodland ordination symbol is 4R (Northern red oak). The forest habitat type commonly is ArCi for the Council soil and ArDe-V for the Bilson soil.

CsD2—Council and Seaton soils, 12 to 20 percent slopes, eroded

These very deep, moderately steep, well drained soils are on back slopes, foot slopes, and head slopes. Individual areas are long and narrow or irregularly shaped and generally range from 5 to 250 acres in size. The Council and Seaton soils are so similar in morphology and behavior characteristics that mapping them separately was not practical. Each mapped area consists of one or both of the soils in varying proportions. The mottles in the substratum of these soils are relict and are not associated with a seasonal high water table. In most cultivated areas, erosion has removed much of the original surface layer of both soils.

Typically, the surface layer of the Council soil is dark brown loam about 7 inches thick. It is mixed with dark yellowish brown subsoil material. The subsoil is about 38 inches thick. It is dark yellowish brown, friable loam in the upper part and dark yellowish brown, friable sandy loam in the lower part. The substratum to a depth of about 60 inches is light yellowish brown and dark yellowish brown, mottled silt loam that has pockets or layers of loam. In places the surface layer is fine sandy loam or silt loam. In some areas the substratum is loam, fine sandy loam, or sand.

Typically, the surface layer of the Seaton soil is dark brown silt loam about 9 inches thick. It is mixed with some brown subsoil material. The subsoil is friable silt loam about 37 inches thick. It is dark brown in the upper part and dark yellowish brown and mottled in the lower part. The substratum to a depth of about 60 inches is yellowish brown and brown, mottled silt loam. In places the substratum is loamy or sandy.

Included with these soils in mapping are small areas of the well drained Elevasil, Gale, and Hixton soils and the moderately well drained Sebbo soils. Elevasil, Gale, and Hixton soils are in the slightly higher positions on the landscape. They are underlain by sand and sandstone. Sebbo soils are on toe slopes. They have a perched water table. They have more clay than the Council soil and more sand than the Seaton soil. Included soils make up 10 to 20 percent of the unit.

Permeability is moderate in the Council and Seaton soils. The available water capacity is high in the Council soil and very high in the Seaton soil. The content of organic matter is moderately low in the surface layer of the Council soil and moderately low or moderate in the surface layer of the Seaton soil. The surface layer of both soils is friable and can be easily tilled, but it tends to crust and puddle after hard rains or forms hard clods if tilled when too wet.

Most areas are used as cropland or pasture. Some extensive areas on the upper head slopes are wooded. These soils are suited to corn and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, water erosion is a severe hazard. It can be controlled by contour farming, contour stripcropping, crop rotations that include grasses and legumes, and conservation tillage (fig. 10). Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth, increases the rate of water infiltration, and reduces the hazard of water erosion.

A cover of pasture plants is effective in controlling erosion. The surface layer is subject to crusting, which restricts the emergence of plants. Overgrazing or grazing when the soils are too wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, measures that improve fertility, and restricted use during wet periods help to keep the pasture in good condition.

These soils are suited to trees. The erosion hazard and the equipment limitation are management concerns. Erosion is accelerated where runoff is concentrated on skid trails, log landings, and haul roads. Removing water with water bars, establishing out-sloping road surfaces, crowning the road surfaces, providing ditches and culverts, and establishing skid trails and haul roads on the contour minimize erosion. Erosion also can be controlled by seeding areas where logging has exposed the surface.

Equipment is restricted by the slope. Low strength is an additional limitation in areas of the Seaton soil. Skid trails and haul roads can be designed so that they conform to the topography and so that grades are kept as low as possible. Log landings can be established in the nearly level or gently sloping

Figure 10.—Contour stripcropping in an area of Council and Seaton soils, 12 to 20 percent slopes, eroded.

included or adjacent areas. The low strength restricts the repeated use of heavy equipment on log landings and haul roads. This restriction can be reduced by using the equipment during dry periods or during periods when the surface is frozen or has adequate snow cover. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Areas of the Seaton soil used for log landings and haul roads can be strengthened with gravel or crushed rock. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal.

Because of the slope, these soils are poorly suited to septic tank absorption fields. This limitation can be overcome by installing a trench absorption system on the contour. Also, included areas that have slopes of less than 6 percent may possibly be used.

Because of the slope, these soils are poorly suited to dwellings. This limitation can be overcome by cutting and filling, by installing retaining walls, or by designing the dwellings so that one side of the basement fronts on the lower part of the slope. Also, the dwellings can be constructed in included areas where the slope is less than 6 percent.

Because of the slope in areas of both soils and the low strength and the potential for frost action in areas of the Seaton soil, these soils are poorly suited to local roads and streets. Low strength and frost action can be overcome by replacing the upper part of the soil with coarse textured base material, such as sand or gravel. Low strength also can be overcome by increasing the thickness of the pavement or the base material. The slope can be overcome by shaping the roadway through cutting and filling or by building the road in the less sloping areas.

The land capability classification is IVe. The woodland ordination symbol is 4R (Northern red oak)

for the Council soil and 5R (Northern red oak) for the Seaton soil. The forest habitat type for this unit commonly is ArCi.

CsE—Council and Seaton soils, 20 to 30 percent slopes

These very deep, steep, well drained soils are on head slopes. Individual areas are irregular in shape and generally range from 5 to 80 acres in size. The mottles in the lower part of the subsoil and the substratum are relict and are not associated with a seasonal high water table. The Council and Seaton soils are so similar in morphology and behavior characteristics that mapping them separately was not practical. Each mapped area consists of one or both of the soils in varying proportions.

Typically, the surface layer of the Council soil is very dark brown loam about 4 inches thick. It is covered by about 2 inches of partially decomposed leaf and grass litter. The subsurface layer is dark brown loam about 3 inches thick. The subsoil is about 37 inches thick. It is dark yellowish brown, friable loam in the upper part and dark yellowish brown, mottled, friable silt loam in the lower part. The substratum to a depth of about 60 inches is mottled, yellowish brown silt loam. In places the surface layer is silt loam, fine sandy loam, or sandy loam. In some areas the substratum is loam, fine sandy loam, or sand.

Typically, the surface layer of the Seaton soil is very dark grayish brown silt loam about 4 inches thick. It is covered by about 2 inches of partially decomposed leaf and grass litter. The subsurface layer is yellowish brown silt loam about 10 inches thick. The subsoil is dark yellowish brown, friable silt loam about 35 inches thick. The substratum to a depth of about 60 inches is yellowish brown, mottled silt loam. In places the substratum is loamy or sandy.

Included with these soils in mapping are small areas of the well drained Elevasil, Hixton, and Gale soils and the moderately well drained Sebbo soils. Also included are some areas where the slope is less than 20 percent or more than 30 percent. Elevasil, Hixton, and Gale soils are in the slightly higher positions on the landscape. They are underlain by sand and sandstone. Sebbo soils are on toe slopes. They have a perched water table. They have more clay than the Council soil and more sand than the Seaton soil. Included areas make up 10 to 25 percent of the unit.

Permeability is moderate in the Council and Seaton soils. The available water capacity is high in the Council soil and very high in the Seaton soil. The content of organic matter is moderately low in the surface layer of the Council soil and moderately low or moderate in the surface layer of the Seaton soil.

Most areas are wooded. A few areas are used as pasture. These soils are not suited to cultivated crops because of the slope and the severe hazard of water erosion.

A cover of pasture plants is effective in controlling erosion. The surface layer is subject to crusting, which restricts the emergence of plants. Overgrazing or grazing when the soil is too wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, pasture rotation, measures that improve fertility, and restricted use during wet periods help to keep the pasture in good condition.

These soils are suited to trees. The erosion hazard and the equipment limitation are management concerns. Erosion is accelerated where runoff is concentrated on skid trails, log landings, and haul roads. Removing water with water bars, establishing out-sloping road surfaces, crowning the road surfaces, providing ditches and culverts, and establishing skid trails and haul roads on the contour minimize erosion. Erosion also can be controlled by seeding areas where logging has exposed the surface.

Equipment is restricted by the slope. Low strength is an additional limitation in areas of the Seaton soil. Skid trails and haul roads can be designed so that they conform to the topography and so that grades are kept as low as possible. Log landings can be established in the nearly level or gently sloping included or adjacent areas. Low strength restricts the repeated use of heavy equipment on log landings and haul roads. This restriction can be reduced by using the equipment during dry periods or during periods when the surface is frozen or has adequate snow cover. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Areas of the Seaton soil used for log landings and haul roads can also be strengthened with gravel or crushed rock. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or mechanical removal.

These soils generally are not suited to septic tank absorption fields, dwellings, or local roads, mainly because of the slope. Overcoming this limitation is difficult. It may be possible to use some of the small, less sloping included areas for these uses, but in general a better suited site should be considered.

The land capability classification is VIe. The

woodland ordination symbol is 4R (Northern red oak) for the Council soil and 5R (Northern red oak) for the Seaton soil. The forest habitat type for this unit commonly is ArCi.

Da—Dawsil mucky peat, 0 to 1 percent slopes

This very deep, nearly level, very poorly drained soil is in depressions. It is subject to ponding. Individual areas are oblong or irregularly shaped and generally range from 20 to 1,000 acres in size.

Typically, the upper 20 inches is dark reddish brown and dark brown mucky peat. The next 20 inches is black muck. The substratum to a depth of about 60 inches is light brownish gray sand. In places the organic layers are mostly peat.

Included with this soil in mapping are small areas of the very poorly drained Loxley and poorly drained Ponycreek soils. Loxley soils are in positions on the landscape similar to those of the Dawsil soil. They have organic material throughout. Ponycreek soils are in the slightly higher positions on the landscape. They are mostly sandy throughout. Included soils make up 5 to 15 percent of the unit.

Permeability is moderately slow to moderately rapid in the organic material in the Dawsil soil and rapid in the substratum. The available water capacity and the content of organic matter are very high. The rooting depth of most plants is limited by an apparent seasonal high water table, which is near or above the surface in undrained areas.

Most areas support wetland vegetation. Because of the wetness, a scarcity of suitable drainage outlets, and an extremely acid reaction, this soil is generally not suited to cultivated crops or pasture. If drained, cultivated areas are subject to burning, subsidence, and soil blowing. If intensive management is applied, some areas of this soil are suited to cranberries and other specialty crops.

Generally, this soil is not suited to trees. In most areas trees grow so poorly that they are barely merchantable at best. A few areas support merchantable stands of conifers. The equipment limitation, seedling mortality, and the windthrow hazard are management concerns. Overcoming these limitations is difficult. A more suitable site should be selected.

This soil generally is not suitable as a site for septic tank absorption fields, dwellings, or local roads and streets because of the subsidence and the ponding. Overcoming these limitations is difficult. A better suited site should be considered.

The land capability classification is VIIw in undrained areas. The woodland ordination symbol is 2W (Black spruce). No forest habitat type is assigned.

DuA—Dunnville sandy loam, 0 to 3 percent slopes

This very deep, nearly level and gently sloping, well drained soil is on low stream terraces. Individual areas are long and narrow and generally range from 4 to 40 acres in size.

Typically, the surface layer and the subsurface layer are dark reddish brown sandy loam about 16 inches thick. The subsoil is about 11 inches thick. It is dark reddish brown, friable sandy loam in the upper part and reddish brown, very friable loamy sand in the lower part. The substratum to a depth of about 60 inches is reddish yellow sand. In places the surface layer is fine sandy loam or loam. In some areas the slope is more than 3 percent.

Included with this soil in mapping are small areas of the excessively drained Sparta soils. These soils are in the slightly higher positions on the landscape. They have more sand throughout. They make up 5 to 15 percent of the unit.

Permeability is moderate or moderately rapid in the loamy alluvium in the Dunnville soil and rapid or very rapid in the sandy alluvium. The available water capacity is moderate. The content of organic matter is moderately low or moderate in the surface layer. The surface layer is friable and can be easily tilled throughout a wide range in moisture content. The rooting depth of most crops is limited by the sandy substratum.

Most areas are used as cropland. A few areas are used as pasture. This soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, the soil is subject to soil blowing. Conservation tillage, winter cover crops, and field windbreaks help to control soil blowing. Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth, increases the rate of water infiltration, and reduces the hazard of soil blowing.

A cover of pasture plants is effective in controlling soil blowing. Overgrazing can cause surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, measures that improve fertility, and pasture rotation help to keep the pasture in good condition.

This soil is suited to trees. The only soil-related management concern is competing vegetation, which

interferes with tree planting and natural regeneration following harvest. Plant competition can be controlled by herbicides or by mechanical removal.

This soil is suited to dwellings and to local roads and streets. The soil readily absorbs the effluent in septic tank absorption fields. It does not adequately filter the effluent, however, because of the rapid or very rapid permeability in the substratum. The poor filtering capacity can result in the pollution of ground water. Mounding the site with suitable filtering material helps to overcome the poor filtering capacity. Also, the effluent can be pumped to an absorption field on a better suited soil in nearby areas.

The land capability classification is IIIs. The woodland ordination symbol is 3A (Northern red oak). The primary forest habitat type commonly is ArDe-V, and the secondary forest habitat type is PVCr.

ElB—Elevasil sandy loam, 2 to 6 percent slopes

This moderately deep, gently sloping, well drained soil is on the summits of hills. Individual areas are long and narrow or irregularly shaped and generally range from 5 to 60 acres in size.

Typically, the surface layer is very dark grayish brown sandy loam about 8 inches thick. The subsoil is about 22 inches thick. It is mostly dark brown and friable. The upper part is sandy loam, the next part is loam, and the lower part is sandy loam. The upper part of the substratum is brownish yellow sand about 6 inches thick. The lower part to a depth of about 60 inches is weakly cemented sandstone. In some places the surface layer is fine sandy loam. In other places the slope is more than 6 percent. In some areas in northern Jackson County, near Clark and Eau Claire Counties, the loamy upper part of the soil contains igneous coarse fragments.

Included with this soil in mapping are small areas of the well drained Bilson, excessively drained Boone, and well drained Hixton soils. Bilson soils are in the slightly lower positions on the landscape. They are underlain by sand. Boone soils are in landscape positions similar to or slightly higher than those of the Elevasil soil. They formed in siliceous sandy residuum. Hixton soils are in positions similar to those of the Elevasil soil. They have more silt and clay in the surface layer and subsoil than the Elevasil soil. Included soils make up 5 to 15 percent of the unit.

Permeability is moderate or moderately rapid in the loamy part of the subsoil in the Elevasil soil. It is rapid in the sandy part of the subsoil and substratum and moderately slow or moderate in the underlying sandstone. The available water capacity is low. The content of organic matter is moderately low in the surface layer. The surface layer is friable and can be easily tilled throughout a wide range in moisture content. The rooting depth of most crops is limited by the underlying sandstone.

Most areas are used as cropland or pasture. A few areas are wooded. This soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, water erosion is a slight or moderate hazard. Also, the soil is subject to soil blowing. Contour farming, contour stripcropping, grassed waterways, winter cover crops, field windbreaks, and conservation tillage help to prevent excessive soil loss. Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth, increases the rate of water infiltration, and helps to control water erosion and soil blowing.

A cover of pasture plants is effective in controlling water erosion and soil blowing. Overgrazing can cause surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, pasture rotation, and measures that improve fertility help to keep the pasture in good condition.

This soil is poorly suited to hardwood trees, which grow slowly and are poorly shaped. It is better suited to pine trees. The only soil-related management concern is competing vegetation, which interferes with tree planting and natural regeneration following harvest. Plant competition can be controlled by herbicides or mechanical removal.

Because of a thin layer over bedrock and a poor filtering capacity, this soil is poorly suited to septic tank absorption fields. These limitations can result in the pollution of ground water. Mounding the site with suitable filtering material helps to overcome the limitations. Also, the effluent can be pumped to an absorption field on a better suited soil in nearby areas.

This soil is suited to dwellings. Because of the potential for frost action, the soil is only moderately suited to local roads and streets. Replacing the upper part of the soil with coarse textured base material, such as sand or gravel, helps to prevent the damage caused by frost action.

The land capability classification is IIIs. The woodland ordination symbol is 2A (Black oak). The primary forest habitat type commonly is PVCr, and the secondary forest habitat type is ArDe-V.

EIC2—Elevasil sandy loam, 6 to 12 percent slopes, eroded

This moderately deep, sloping, well drained soil is on shoulder slopes and back slopes and the upper foot slopes of hills. Individual areas are round or irregularly shaped and generally range from 5 to 80 acres in size.

In most cultivated areas, erosion has removed much of the original surface layer. Typically, the remaining surface layer is dark brown sandy loam about 8 inches thick. It is mixed with some brown subsoil material. The subsoil is mostly dark yellowish brown, friable sandy loam. It is about 18 inches thick. The upper part of the substratum is brownish yellow sand about 8 inches thick. The lower part to a depth of about 60 inches is weakly cemented sandstone. In some places the surface layer is fine sandy loam. In other places the slope is less than 6 percent or more than 12 percent. In some areas in northern Jackson County, near Clark and Eau Claire Counties, the loamy upper part of the soil contains igneous coarse fragments.

Included with this soil in mapping are small areas of the well drained Bilson, excessively drained Boone, well drained Council, and excessively drained Tarr soils. Bilson, Council, and Tarr soils are in the lower positions on the landscape. Bilson and Council soils are very deep. Bilson soils are underlain by sand, and Council soils are loamy throughout. Tarr soils are sandy throughout. Boone soils are in the higher positions on the landscape. They formed in siliceous sandy residuum. Included soils make up 5 to 15 percent of the unit.

Permeability is moderate or moderately rapid in the loamy part of the subsoil in the Elevasil soil. It is rapid in the sandy part of the subsoil and substratum and moderately slow or moderate in the underlying sandstone. The available water capacity is low. The content of organic matter is moderately low in the surface layer. The surface layer is friable and can be easily tilled throughout a wide range in moisture content. The rooting depth of most crops is limited by the underlying sandstone.

Most areas are used as cropland or pasture. A few areas are wooded. This soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. In most years crop yields are limited by the low available water capacity. The soil is poorly suited to irrigation because of the slope. If cultivated crops are grown, water erosion is a moderate hazard. Also, the soil is subject to soil blowing. Contour farming, contour stripcropping, field windbreaks, and conservation tillage help to prevent excessive soil loss. Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth, increases the rate of water infiltration, and helps to control erosion and soil blowing.

A cover of pasture plants is effective in controlling erosion and soil blowing. Overgrazing can cause surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, pasture rotation, and measures that improve fertility help to keep the pasture in good condition.

This soil is poorly suited to hardwood trees, which grow slowly and are poorly shaped. It is better suited to pine trees. Equipment use at log landings is restricted by the slope. Log landings can be established in nearly level and gently sloping included or adjacent areas. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or mechanical removal.

Because of a thin layer over bedrock and a poor filtering capacity, this soil is poorly suited to septic tank absorption fields. These limitations can result in the pollution of ground water. Mounding the site with suitable filtering material helps to overcome the limitations. Also, the effluent can be pumped to an absorption field on a better suited soil in a nearby area.

Because of the slope, this soil is only moderately suited to dwellings. This limitation can be overcome by cutting and filling, by installing retaining walls, or by designing the dwellings so that one side of the basement fronts on the lower part of the slope. Also, the dwellings can be constructed in included areas where the slope is less than 6 percent.

Because of the slope and the potential for frost action, this soil is only moderately suited to local roads and streets. The slope can be overcome by shaping the roadway through cutting and filling. Also, the roads can be built in the less sloping areas. Replacing the upper part of the soil with coarse textured base material, such as sand or gravel, helps to prevent the damage caused by frost action.

The land capability classification is IIIe. The woodland ordination symbol is 2A (Black oak). The primary forest habitat type commonly is PVCr, and the secondary forest habitat type is ArDe-V.

EID2—Elevasil sandy loam, 12 to 20 percent slopes, eroded

This moderately deep, moderately steep, well drained soil is on shoulders, nose slopes, back

slopes, and the upper foot slopes of hills and ridges. Individual areas are irregular in shape and generally range from 5 to 60 acres in size.

In most cultivated areas, erosion has removed much of the original surface layer. Typically, the remaining surface layer is dark brown sandy loam about 8 inches thick. It is mixed with some brown subsoil material. The subsoil is about 16 inches thick. It is dark brown and yellowish brown, friable sandy loam in the upper part and dark brown and reddish yellow loamy sand in the lower part. The upper part of the substratum is reddish yellow sand about 9 inches thick. The lower part to a depth of about 60 inches is weakly cemented sandstone. In places the surface layer is fine sandy loam. In some areas the slope is less than 12 percent or more than 20 percent.

Included with this soil in mapping are small areas of the well drained Bilson, excessively drained Boone, well drained Council, and excessively drained Tarr soils. The very deep Bilson, Council, and Tarr soils are in the lower positions on the landscape. Bilson soils are underlain by sand, Council soils are loamy throughout, and Tarr soils are sandy throughout. Boone soils are in the higher positions on the landscape. They are sandy throughout. Included soils make up 10 to 15 percent of the unit.

Permeability is moderate or moderately rapid in the loamy part of the subsoil in the Elevasil soil. It is rapid in the sandy part of the subsoil and substratum and moderately slow or moderate in the underlying sandstone. The available water capacity is low. The content of organic matter is moderately low in the surface layer. The surface layer is friable and can be easily tilled throughout a wide range in moisture content. The rooting depth of most crops is limited by the underlying sandstone.

Most areas are used as cropland or pasture. A few areas are wooded. This soil is suited to corn and small grain and to grasses and legumes for hay and pasture. In most years crop yields are limited by the low available water capacity. The soil is not suited to irrigation because of the slope. If cultivated crops are grown, water erosion is a severe hazard. Also, the soil is subject to soil blowing. Contour farming, contour stripcropping, crop rotations that include grasses and legumes, and conservation tillage help to prevent excessive soil loss. Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth, increases the rate of water infiltration, and helps to control water erosion and soil blowing.

A cover of pasture plants is effective in controlling water erosion and soil blowing. Overgrazing can cause surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, pasture rotation, and measures that improve fertility help to keep the pasture in good condition.

This soil is poorly suited to hardwood trees, which grow slowly and are poorly shaped. It is better suited to pine trees. The erosion hazard and the equipment limitation are management concerns. Erosion is accelerated where runoff is concentrated on skid trails, log landings, and haul roads. Removing water with water bars, establishing out-sloping road surfaces, crowning the road surfaces, providing ditches and culverts, and establishing skid trails and haul roads on the contour minimize erosion. Erosion also can be controlled by seeding areas where logging has exposed the surface.

The use of equipment is restricted by the slope. Skid trails and haul roads can be designed so that they conform to the topography and so that grades are kept as low as possible. Log landings can be established in nearly level or gently sloping included or adjacent areas. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or mechanical removal.

Because of a thin layer over bedrock, a poor filtering capacity, and the slope, this soil generally is poorly suited to septic tank absorption fields. It readily absorbs but does not adequately filter the effluent. The poor filtering capacity can result in the pollution of ground water. The thin layer and the poor filtering capacity can be overcome by mounding the site with suitable filtering material. The slope can be overcome by cutting and filling or by installing a trench absorption system on the contour.

Because of the slope, this soil is poorly suited to dwellings. This limitation can be overcome by cutting and filling, installing retaining walls, or designing the dwellings so that one side of the basement fronts on the lower part of the slope. Also, the dwellings can be constructed in included areas where the slope is less than 6 percent.

Because of the slope, this soil is poorly suited to local roads and streets. This limitation can be overcome by shaping the roadway through cutting and filling.

The land capability classification is IVe. The woodland ordination symbol is 2R (Black oak). The primary forest habitat type commonly is PVCr, and the secondary forest habitat type is ArDe-V.

Eo—Elm Lake mucky sand, 0 to 2 percent slopes

This moderately deep, nearly level, poorly drained soil is in drainageways and depressions. It is subject to ponding. Individual areas are long and narrow and generally range from 10 to 100 acres in size.

Typically, the surface layer is black mucky sand about 2 inches thick. The upper part of the substratum is mostly light brownish gray and light gray, mottled sand and yellowish brown, mottled sandy clay loam. The lower part of the substratum, from a depth of about 38 to 60 inches, is weakly cemented interbedded sandstone and shale. In places the surface layer is muck, mucky loamy sand, or loamy sand.

Included with this soil in mapping are small areas of the somewhat poorly drained Fairchild and poorly drained Veedum soils. Fairchild soils are in the slightly higher positions on the landscape. Veedum soils are in positions on the landscape similar to those of the Elm Lake soil. They have more silt and clay throughout than the Elm Lake soil. Included soils make up 5 to 15 percent of the unit.

Permeability is rapid in the sandy upper part of the substratum in the Elm Lake soil. It is moderately slow or moderate in the loamy lower part of the substratum and extremely slow to moderately slow in the underlying interbedded sandstone and shale. The available water capacity is low. The content of organic matter is very high in the surface layer. A perched seasonal high water table is near or above the surface in undrained areas. The rooting depth of most plants is limited by the seasonal high water table and by the interbedded sandstone and shale.

Most areas of this soil are used as unimproved pasture or as woodland. Some areas are used as wetland wildlife habitat. Undrained areas generally are not suited to cultivated crops because of the wetness and the frost hazard. Drained areas are suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Planting early maturing corn varieties or growing the corn for silage helps to overcome the frost hazard.

Unless it is drained, this soil is poorly suited to pasture. Establishing an improved pasture is difficult because of the wetness. Grazing is limited to the short periods when the soil is dry. The native vegetation generally is of poor quality for forage.

This soil is suited to some conifers but is poorly suited to most other trees. Most trees grow slowly and are poorly shaped. The equipment limitation, seedling mortality, and the windthrow hazard are management concerns. Equipment use is restricted by the wetness. This restriction can be reduced by using equipment during dry periods or during periods when the surface is frozen or has adequate snow cover. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be strengthened with gravel or crushed rock. They also can be established in better suited included or adjacent areas. Culverts and ditches can be used to maintain natural drainage systems along haul roads. Seedling mortality caused by wetness can be reduced by careful machine planting on prepared ridges or by hand planting on cradle knolls and in the drier included areas. Selecting vigorous nursery stock for planting reduces the seedling mortality rate. Harvesting by clearcut or area-selection methods helps to prevent windthrow of the remaining trees. Natural seeding from unharvested trees promotes regeneration. Maintaining permanent all-season roads allows quick salvage of downed trees after periodic storms. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or mechanical removal.

This soil generally is not suitable as a site for septic tank absorption fields, dwellings, or local roads and streets, mainly because of the ponding. Overcoming this limitation is difficult. A better suited site should be considered.

The land capability classification is VIw in undrained areas. The woodland ordination symbol is 3W (Red maple). No forest habitat type is assigned.

Et—Ettrick silt loam, 0 to 2 percent slopes

This very deep, nearly level, poorly drained soil is on flood plains along streams and small rivers. It is subject to ponding and to frequent flooding for brief periods. Individual areas are long and narrow and generally range from 4 to 100 acres in size.

Typically, the surface layer is very dark gray silt loam about 4 inches thick. The subsurface layer is black, mottled silt loam about 11 inches thick. The subsoil is mottled, friable silt loam about 25 inches thick. It is gray in the upper part and grayish brown in the lower part. The substratum to a depth of about 60 inches is gray, mottled silt loam. In places the surface layer is thinner and lighter colored or is muck. In some areas the substratum is fine sand.

Included with this soil in mapping are small areas of the somewhat poorly drained Coffton, poorly

drained Kalmarville, somewhat poorly drained Orion, and very poorly drained Palms soils. Coffton and Orion soils are in the slightly higher positions on flood plains. Kalmarville and Palms soils are in positions similar to those of the Ettrick soil. Kalmarville soils are underlain by sand. Palms soils formed in 16 to 51 inches of organic material. Also included are small areas of silty alluvium underlain by organic material. Included areas make up 5 to 15 percent of the unit.

Permeability is moderately slow in the subsoil of the Ettrick soil and moderate or moderately slow in the substratum. The available water capacity is very high. The content of organic matter is high or very high in the surface layer. The surface layer is friable and can be easily tilled, but it tends to crust and puddle after hard rains or forms hard clods if tilled when too wet. The rooting depth of most plants is limited by an apparent seasonal high water table, which is above or near the surface in undrained areas.

Most areas of this soil are used as unimproved pasture or support brushy or grassy wetland vegetation. A few areas, mainly along entrenched streams, are used for cultivated crops or for pasture. Undrained areas of this soil are poorly suited to crops because of the wetness and the flooding. If drained and protected from flooding, most areas are well suited to corn, soybeans, and small grain and, to a lesser extent, to grasses and legumes for hay and pasture.

A cover of pasture plants is effective in controlling scouring by floodwater. If drained and protected from flooding, this soil is suited to pasture. Alfalfa is generally short lived because of some seasonal wetness and frost action. Red clover and grasses are generally grown. Overgrazing or grazing when the soil is wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, measures that improve fertility, pasture rotation, and restricted use during wet periods help to keep the pasture in good condition.

Most areas of this soil are not naturally forested and generally are not managed for trees. The trees grow slowly and are poorly shaped. The equipment limitation, seedling mortality, and the windthrow hazard are management concerns. Overcoming these limitations is difficult. Better sites should be considered if merchantable trees are to be grown.

This soil generally is not suitable as a site for septic tank absorption fields, dwellings, or local roads because of the flooding and the ponding. Overcoming these limitations is difficult. A better suited site should be considered.

The land capability classification is VIw in undrained areas and IIw in drained areas. No woodland ordination symbol or forest habitat type is assigned.

FaA—Fairchild sand, 0 to 3 percent slopes

This moderately deep, nearly level and gently sloping, somewhat poorly drained soil is on toe slopes. Individual areas are irregular in shape and generally range from 10 to 80 acres in size.

Typically, the surface layer is black sand about 2 inches thick. It is covered by about 2 inches of very dark grayish brown mucky peat, which is a mat of partially decomposed forest litter. The subsurface layer is grayish brown sand about 7 inches thick. The subsoil is about 30 inches thick. The upper part is dark reddish brown, very friable sand. The next part is yellowish brown and brownish yellow, mottled, very friable sand. The lower part is light brownish gray, mottled, firm loam. The substratum to a depth of about 60 inches is weakly cemented interbedded sandstone and shale. In places the surface layer is loamy sand.

Included with this soil in mapping are small areas of the poorly drained Elm Lake, moderately well drained Ludington, and somewhat poorly drained Merrillan soils. Elm Lake soils are in the slightly lower positions on the landscape. Ludington soils are in the higher positions. Merrillan soils are in positions similar to those of the Fairchild soil. Merrillan soils have more silt and clay in the upper part of the solum than the Fairchild soil. Included soils make up 10 to 15 percent of the unit.

Permeability is rapid in the sandy upper part of the subsoil in the Fairchild soil. It is moderately slow or moderate in the loamy lower part of the subsoil and extremely slow to moderately slow in the underlying interbedded sandstone and shale. The available water capacity is low. The content of organic matter is moderate or high in the surface layer. The surface layer is very friable and can be easily tilled throughout a wide range in moisture content. A seasonal high water table is perched at a depth of 1 to 2 feet. The rooting depth of most crops is limited by the seasonal high water table during wet periods of the growing season and by the underlying interbedded sandstone and shale.

Most areas are wooded. Some areas are used for

pasture. Most of the few areas that are used as cropland are reverting to woodland. A cover of pasture plants is effective in controlling soil blowing. Forage yields are generally low unless fertilizer is applied and an adequate amount of moisture is supplied either through a controlled drainage system or through irrigation. Alfalfa is short lived unless the soil is drained. Red clover is generally grown. Overgrazing or grazing when the soil is too wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is suited to trees. The equipment limitation, seedling mortality, and the windthrow hazard are management concerns. Equipment use is restricted by the wetness, loose sand, and low soil strength. These restrictions can be reduced by using the equipment during dry periods or during periods when the surface is frozen or has adequate snow cover. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be strengthened with gravel or crushed rock. The log landings and haul roads can also be established in better suited included or adjacent areas. Culverts and ditches can be used to maintain natural drainage systems along haul roads. Seedling mortality caused by seasonal droughtiness can be reduced by careful planting of vigorous nursery stock or containerized seedlings and by planting when the soil is moist. Harvesting by clearcut or area-selection methods helps to prevent windthrow of the remaining trees. Natural seeding from unharvested trees promotes regeneration. Maintaining permanent all-season roads allows quick salvage of downed trees after periodic storms. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal.

Because of a thin layer over bedrock, the wetness, and the restricted permeability, this soil is poorly suited to septic tank absorption fields. Mounding the site with suitable filtering material helps to overcome these limitations. Also, the effluent can be pumped to an absorption field on a better suited soil in nearby areas.

Because of the wetness, this soil is poorly suited to dwellings. The wetness can be overcome by installing tile drains around foundations and providing gravity outlets or other dependable outlets and by constructing the foundations on coarse textured fill material above the level of wetness.

Because of the wetness and the potential for frost action, this soil is only moderately suited to local roads and streets. Installing a subsurface drainage system and replacing the upper part of the soil with coarse textured base material, such as sand or gravel, helps to prevent the damage caused by wetness and by frost action.

The land capability classification is IIIw. The woodland ordination symbol is 5W (Jack pine). The primary forest habitat type commonly is PVHa, and the secondary forest habitat type is PVRh.

FeA—Fairchild-Elm Lake complex, 0 to 3 percent slopes

These moderately deep soils are nearly level and gently sloping. The somewhat poorly drained Fairchild soil is on toe slopes. The poorly drained Elm Lake soil is in drainageways and depressions. The Elm Lake soil is subject to ponding. The Fairchild and Elm Lake soils occur as areas so intricately mixed or so small that it was not practical to map them separately. Individual areas are irregular in shape and generally range from 40 to 1,000 acres in size. They are about 40 to 50 percent Fairchild soil and 35 to 45 percent Elm Lake soil.

Typically, the surface layer of the Fairchild soil is black sand about 2 inches thick. It is covered by about 2 inches of very dark grayish brown mucky peat, which is a mat of partially decomposed forest litter. The subsurface layer is grayish brown sand about 9 inches thick. The subsoil is about 26 inches thick. The upper part is dark reddish brown, very friable sand. The next part is dark brown and brownish yellow, mottled, very friable sand. The lower part is pale olive, mottled, firm clay loam. The substratum to a depth of about 60 inches is weakly cemented interbedded sandstone and shale. In places the surface layer is loamy sand.

Typically, the surface layer of the Elm Lake soil is black muck about 4 inches thick. The subsurface layer is very dark gray sand about 4 inches thick. The upper part of the substratum is gray, loose sand. The next part is grayish brown, mottled, loose loamy sand over light brownish gray, mottled, firm clay loam. The lower part of the substratum, from a depth of about 38 to 60 inches, is weakly cemented interbedded sandstone and shale. In places the surface layer is mucky sand, mucky loamy sand, or loamy sand.

Included with these soils in mapping are small

areas of the very poorly drained Dawsil and somewhat poorly drained Merrillan soils. Dawsil soils are in positions on the landscape similar to those of the Elm Lake soil. Dawsil soils formed in 16 to 51 inches of organic material. Merrillan soils are in positions similar to those of the Fairchild soil. They have more silt and clay in the solum than the Fairchild soil. Included soils make up 5 to 20 percent of the unit.

Permeability is rapid in the sandy upper part of the Fairchild and Elm Lake soils, moderately slow or moderate in the loamy part, and extremely slow to moderately slow in the underlying interbedded sandstone and shale. The available water capacity is low in both soils. The content of organic matter is moderate or high in the surface layer of the Fairchild soil and very high in the surface layer of the Elm Lake soil. The surface layer of the Fairchild soil is very friable and can be easily tilled throughout a wide range in moisture content. A perched seasonal high water table is at a depth of 1 to 2 feet in the Fairchild soil and is at or near the surface in the Elm Lake soil. The rooting depth of most crops is limited by the seasonal high water table and the interbedded sandstone and shale.

Most areas of these soils are wooded or support wetland vegetation. Most of the few areas that are used for pasture are reverting to woodland. The Fairchild soil is suited to trees. The Elm Lake soil is suited to some conifers but is poorly suited to most other trees. The equipment limitation, seedling mortality, and the windthrow hazard are management concerns.

Equipment use is restricted by the wetness of the Fairchild and Elm Lake soils and by the loose sand and low strength in areas of the Fairchild soil. These restrictions can be reduced by using the equipment during dry periods or during periods when the surface is frozen or has adequate snow cover. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be strengthened with gravel or crushed rock. The log landings and haul roads can also be established in better suited included or adjacent areas. Culverts and ditches can be used to maintain natural drainage systems along haul roads. Seedling mortality caused by seasonal droughtiness in areas of the Fairchild soil can be reduced by careful planting of vigorous nursery stock or containerized seedlings and by planting when the soil is moist. Seedling mortality resulting from the seasonal wetness of the Elm Lake soil can be reduced by careful machine planting on prepared ridges or by hand planting on cradle knolls and in the drier included areas. Selecting vigorous nursery stock for planting also reduces the seedling mortality rate. Harvesting by clearcut or area-selection methods helps to prevent windthrow of the remaining trees. Natural seeding from unharvested trees promotes regeneration. Maintaining permanent all-season roads allows quick salvage of downed trees after periodic storms. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal.

Because of a thin layer over bedrock, the wetness, and the restricted permeability, the Fairchild soil is poorly suited to septic tank absorption fields. Mounding the site with suitable filtering material helps to overcome these limitations. Also, the effluent can be pumped to an absorption field on a better suited soil in nearby areas. Because of a thin layer over bedrock, the ponding, and the restricted permeability, the Elm Lake soil generally is not suitable as a site for septic tank absorption fields. Overcoming these limitations is difficult. A better suited site should be considered.

Because of the wetness, the Fairchild soil is poorly suited to dwellings. This limitation can be overcome by installing tile drains around foundations and providing gravity outlets or other dependable outlets and by constructing the foundations on coarse textured fill material above the level of wetness. Because of the ponding, the Elm Lake soil is generally not suitable as a site for dwellings. Overcoming the ponding is difficult. A better suited site should be considered.

Because of the wetness and the potential for frost action, the Fairchild soil is only moderately suited to local roads and streets. Installing a subsurface drainage system and replacing the upper part of the soil with coarse textured base material, such as sand or gravel, help to prevent the damage caused by wetness and by frost action. Because of the ponding, the Elm Lake soil generally is not suited to local roads and streets. Overcoming this limitation is difficult. A better suited site should be considered.

The land capability classification is VIw in undrained areas. The woodland ordination symbol is 5W (Jack pine) for the Fairchild soil and 3W (Red maple) for the Elm Lake soil. The primary forest habitat type commonly is PVHa for the Fairchild soil, and the secondary forest habitat type is PVRh. No forest habitat type is assigned for the Elm Lake soil.

GaC2—Gale silt loam, 6 to 12 percent slopes, eroded

This moderately deep, sloping, well drained soil is on summits and shoulders of ridges, knolls, and hills. Individual areas are irregular in shape and generally range from 5 to 25 acres in size.

In most cultivated areas, erosion has removed much of the original surface layer. Typically, the remaining surface layer is dark brown silt loam about 9 inches thick. It is mixed with some yellowish brown subsoil material. The subsoil is about 19 inches thick. It is yellowish brown and dark brown, friable silt loam in the upper part and dark brown, friable loam in the lower part. The upper part of the substratum is yellowish brown sand about 10 inches thick. The lower part to a depth of about 60 inches is weakly cemented sandstone. In places the surface layer is thicker and darker. In some areas the slope is less than 6 percent or more than 12 percent.

Included with this soil in mapping are small areas of the well drained Hixton and Seaton soils. Hixton soils are in the higher positions on the landscape. They have more sand in the subsoil than the Gale soil. Seaton soils are in positions similar to those of the Gale soil. They are silty throughout. Included soils make up 10 to 15 percent of the unit.

Permeability is moderate in the subsoil of the Gale soil. It is rapid in the sandy substratum and moderately slow or moderate in the underlying sandstone. The available water capacity is moderate. The content of organic matter is moderately low or moderate in the surface layer. The surface layer is friable and can be easily tilled, but it tends to crust and puddle after hard rains or forms hard clods if it is tilled when too wet. The rooting depth of most crops is limited by the underlying sandstone.

Most areas are used as cropland. A few areas are used as pasture or woodland. This soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, water erosion is a moderate hazard. It can be controlled by contour farming, contour stripcropping, grassed waterways, and conservation tillage. Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth, increases the rate of water infiltration, and reduces the hazard of water erosion.

A cover of pasture plants is effective in controlling water erosion. The surface layer is subject to crusting, which restricts the emergence of plants. Overgrazing or grazing when the soil is too wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, measures that improve fertility, and restricted use during wet periods help to keep the pasture in good condition.

This soil is suited to trees. Equipment use is restricted by the slope and by low strength. Log landings can be established in nearly level or gently sloping included or adjacent areas. Low strength can be overcome by using equipment during dry periods or during periods when the surface is frozen or has adequate snow cover. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be strengthened with gravel or crushed rock. The log landings and haul roads can also be established in more suitable included or adjacent areas. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal.

Because of a thin layer over bedrock, seepage, and a poor filtering capacity, this soil is poorly suited to septic tank absorption fields. These limitations can result in the pollution of ground water. Mounding the site with suitable filtering material helps to overcome the limitations. The effluent can also be pumped to an absorption field on a better suited soil in nearby areas.

Because of the slope and the potential for shrinking and swelling, this soil is only moderately suited to dwellings. The slope can be overcome by cutting and filling, by installing retaining walls, or by designing the dwellings so that one side of the basement fronts on the lower part of the slope. Also, the dwellings can be constructed in the less sloping included areas. The shrink-swell potential can be overcome by excavating the soil and replacing it with coarse textured material, such as sand or gravel; by strengthening the basement walls; and by installing a subsurface drainage system around the dwellings at or below the basement elevation.

Because of the low strength and the potential for frost action, this soil is poorly suited to local roads and streets. These limitations can be overcome by replacing the upper part of the soil with coarse textured base material, such as sand or gravel. Low strength also can be overcome by increasing the thickness of the pavement or base material.

The land capability classification is IIIe. The woodland ordination symbol is 5A (Northern red oak). The primary forest habitat type commonly is ArCi, and the secondary forest habitat type is ArDe-V.

GaD2—Gale silt loam, 12 to 25 percent slopes, eroded

This moderately deep, moderately steep and steep, well drained soil is on shoulders, nose slopes, and the upper foot slopes of ridges, knolls, and hills. Individual areas are irregular in shape and generally range from 5 to 25 acres in size.

In most cultivated areas, erosion has removed much of the original surface layer. Typically, the remaining surface layer is dark grayish brown silt loam about 8 inches thick. It is mixed with some yellowish brown subsoil material. The subsoil is about 23 inches thick. It is dark yellowish brown and yellowish brown, friable silt loam in the upper part and yellowish brown, friable sandy loam in the lower part. The upper part of the substratum is brownish yellow sand about 8 inches thick. The lower part to a depth of about 60 inches is weakly cemented sandstone bedrock. In places the surface layer is thicker and darker. In some areas the slope is less than 12 percent or more than 25 percent.

Included with this soil in mapping are small areas of the well drained Hixton and Seaton soils. Hixton soils are in the slightly higher positions on the landscape. They have more sand in the subsoil than the Gale soil. Seaton soils are in positions similar to those of the Gale soil. They are silty throughout. Included soils make up 10 to 15 percent of the unit.

Permeability is moderate in the subsoil of the Gale soil. It is rapid in the sandy substratum and moderately slow or moderate in the underlying sandstone. The available water capacity is moderate. The content of organic matter is moderately low or moderate in the surface layer. The surface layer is friable and can be easily tilled, but it tends to crust and puddle after hard rains or forms hard clods if it is tilled when too wet. The rooting depth of most crops is limited by the underlying sandstone.

Most areas are used as cropland or pasture. A few extensive areas are wooded. This soil is suited to corn and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, water erosion is a severe hazard. It can be controlled by contour farming, contour stripcropping, crop rotations that include grasses and legumes, and conservation tillage. Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth, increases the rate of water infiltration, and reduces the hazard of water erosion.

A cover of pasture plants is effective in controlling water erosion. The surface layer is subject to crusting, which restricts the emergence of plants. Overgrazing or grazing when the soil is too wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, measures that improve fertility, and restricted use during wet periods help to keep the pasture in good condition.

This soil is suited to trees. The erosion hazard and the equipment limitation are management concerns. Erosion is accelerated where runoff is concentrated on skid trails, log landings, and haul roads. Removing water with water bars, establishing out-sloping road surfaces, crowning the road surfaces, providing ditches and culverts, and establishing skid trails and haul roads on the contour minimize erosion. Erosion also can be controlled by seeding areas where logging has exposed the surface.

Equipment use is restricted by the slope and by low strength. Skid trails and haul roads can be designed so that they conform to the topography and so that grades are kept as low as possible. Log landings can be established in the nearly level or gently sloping included or adjacent areas. Low strength can be overcome by using the equipment during dry periods or during periods when the surface is frozen or has an adequate snow cover. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be strengthened with gravel or crushed rock. The log landings and haul roads can also be established in more suitable included or adjacent areas. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal.

Because of a thin layer over bedrock, a poor filtering capacity, and the slope, this soil generally is poorly suited to septic tank absorption fields. It readily absorbs but does not adequately filter the effluent. The thin layer and the poor filtering capacity can be overcome by mounding the site with suitable filtering material. The slope can be overcome by cutting and filling or by installing a trench absorption system on the contour.

Because of the slope, this soil is poorly suited to dwellings. This limitation can be overcome by cutting and filling, by installing retaining walls, or by designing the dwellings so that one side of the basement fronts on the lower part of the slope. Also, the dwellings can be constructed in the included areas where the slope is less than 6 percent.

Because of the low strength, the slope, and the potential for frost action, this soil is poorly suited to local roads and streets. Low strength and the potential for frost action can be overcome by

replacing the upper part of the soil with coarse textured base material, such as sand or gravel. Low strength also can be overcome by increasing the thickness of the pavement or base material. The slope can be overcome by shaping the roadway through cutting and filling. Also, the roads can be built in the less sloping areas.

The land capability classification is IVe. The woodland ordination symbol is 5R (Northern red oak). The primary forest habitat type commonly is ArCi, and the secondary forest habitat type is ArDe-V.

GoB—Gosil loamy sand, 0 to 6 percent slopes

This very deep, nearly level and gently sloping, excessively drained soil is on flats and knolls. Individual areas are irregular in shape and generally range from 5 to 80 acres in size.

Typically, the surface layer is dark brown loamy sand about 9 inches thick. The subsoil is about 18 inches thick. It is dark brown and brown, very friable loamy sand in the upper part and strong brown, very friable sand in the lower part. The substratum to a depth of about 60 inches is reddish yellow and very pale brown sand. In places the subsoil is sandy loam or loamy fine sand. In some areas the slope is more than 6 percent.

Included with this soil in mapping are small areas of the well drained Bilson and excessively drained Tarr soils. These soils are in positions on the landscape similar to those of the Gosil soil. Bilson soils have more silt and clay in the surface layer and subsoil than the Gosil soil, and Tarr soils have more sand and slightly less silt and clay in the solum. Included soils make up 5 to 15 percent of the unit.

Permeability is rapid in the Gosil soil. The available water capacity is low. The content of organic matter is low or moderately low in the surface layer. The surface layer is very friable and can be easily tilled throughout a wide range in moisture content.

Most areas are used as cropland. This soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. In many years crop yields are limited by the low available water capacity. If irrigated, the soil is suited to the commonly grown farm crops and to vegetables, such as snap beans and sweet corn. If cultivated crops are grown, water erosion is a slight hazard. Also, the soil is subject to soil blowing. Winter cover crops, conservation tillage, wind stripcropping, and field windbreaks help to prevent excessive soil loss. Returning crop residue to the soil or adding other organic material reduces the hazard of soil blowing and the amount of water lost through evaporation, increases the rate of water infiltration, and helps to maintain fertility and good tilth.

A cover of pasture plants is effective in controlling soil blowing and water erosion. Forage yields are generally low unless fertilizer is applied and the supply of moisture is adequate. Planting early in spring, before the soil has a chance to dry, helps to overcome the droughtiness. Later plantings are likely to have a poor survival rate. Overgrazing can cause surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Measures that improve fertility, proper stocking rates, and pasture rotation help to keep the pasture in good condition.

This soil is suited to trees. The only soil-related management concern is competing vegetation, which interferes with tree planting and natural regeneration after trees are harvested. Plant competition can be controlled by herbicides or by mechanical removal.

This soil is suited to dwellings and to local roads and streets. It readily absorbs the effluent in septic tank absorption fields, but it does not adequately filter the effluent because of the rapid permeability. The poor filtering capacity can result in the pollution of ground water.

The land capability classification is IVs. The woodland ordination symbol is 3A (Northern red oak). The primary forest habitat type commonly is PVHa, and the secondary forest habitat type is PVCr.

GoC—Gosil loamy sand, 6 to 12 percent slopes

This very deep, sloping, excessively drained soil is on back slopes and foot slopes. Individual areas are long and narrow and generally range from 5 to 30 acres in size.

Typically, the surface layer is dark brown loamy sand about 9 inches thick. The subsoil is about 18 inches thick. It is dark brown and dark yellowish brown, very friable loamy sand in the upper part and yellowish brown, very friable sand in the lower part. The substratum to a depth of about 60 inches is brownish yellow sand that has thin lamellae of reddish brown loamy sand. In places the subsoil is sandy loam.

Included with this soil in mapping are small areas of the well drained Bilson and excessively drained Tarr soils. These soils are in positions on the landscape similar to those of the Gosil soil. Bilson soils have more silt and clay in the surface layer and

subsoil than the Gosil soil, and Tarr soils have more sand and slightly less silt and clay in the solum. Included soils make up 5 to 15 percent of the unit.

Permeability is rapid in the Gosil soil. The available water capacity is low. The content of organic matter is low or moderately low in the surface layer. The surface layer is very friable and can be easily tilled throughout a wide range in moisture content.

Most areas are used as cropland. This soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. In many years crop yields are limited by the low available water capacity. The soil is poorly suited to irrigation because of the slope. If cultivated crops are grown, water erosion is a moderate hazard. Also, the soil is subject to soil blowing. Conservation tillage, wind stripcropping, field windbreaks, contour farming, and contour stripcropping help to prevent excessive soil loss. Returning crop residue or other organic material to the soil reduces the amount of water lost through evaporation, increases the rate of water infiltration, helps to maintain fertility and good tilth, and helps to control erosion and soil blowing.

A cover of pasture plants is effective in controlling water erosion and soil blowing. Forage yields are generally low unless fertilizer is applied and adequate moisture is available. Planting early in spring, before the soil has a chance to dry, helps to overcome the droughtiness. Later plantings are likely to have a poor survival rate. Overgrazing can cause surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Measures that improve fertility, proper stocking rates, and pasture rotation help to keep the pasture in good condition.

This soil is suited to trees. Equipment use on log landings is restricted by the slope. Log landings can be established in nearly level or gently sloping included or adjacent areas. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or mechanical removal.

This soil readily absorbs the effluent in septic tank absorption fields. It does not adequately filter the effluent, however, because of the rapid permeability. The poor filtering capacity can result in the pollution of ground water.

Because of the slope, this soil is only moderately suited to dwellings. This limitation can be overcome by cutting and filling, by installing retaining walls, or by designing the dwellings so that one side of the basement fronts on the lower part of the slope. Also, the dwellings can be constructed in included areas where the slope is less than 6 percent.

Because of the slope, this soil is only moderately suited to local roads and streets. This limitation can be overcome by shaping the roadway through cutting and filling or building the roads in the less sloping areas.

The land capability classification is IVs. The woodland ordination symbol is 3A (Northern red oak). The primary forest habitat type commonly is PVHa, and the secondary forest habitat type is PVCr.

HkB—Hiles-Kert silt loams, 0 to 6 percent slopes

These soils are moderately deep, nearly level and gently sloping, and moderately well drained and somewhat poorly drained. The Hiles soil is on the summits and shoulders of knolls. The Kert soil is on the foot slopes of knolls. The Hiles and Kert soils occur as areas so intricately mixed or so small that it was not practical to map them separately. Individual areas are irregular in shape and generally range from 5 to 60 acres in size. They are about 40 to 50 percent Hiles soil and 30 to 40 percent Kert soil.

Typically, the surface layer of the Hiles soil is dark brown silt loam about 8 inches thick. The subsurface layer is brown silt loam about 4 inches thick. The subsoil is about 16 inches thick. It is mixed dark yellowish brown and brown, friable silt loam in the upper part and dark yellowish brown, mottled, friable loam in the lower part. The substratum to a depth of about 60 inches is weakly cemented interbedded sandstone and shale. In places the surface layer is loam. In some areas the slope is more than 6 percent.

Typically, the surface layer of the Kert soil is very dark grayish brown silt loam about 8 inches thick. The subsurface layer is brown, mottled silt loam about 2 inches thick. The subsoil is about 29 inches thick. The upper part is a mixture of yellowish brown and brown, mottled, friable silt loam, and the lower part is light brownish gray and light gray, mottled, firm loam and clay loam. The substratum to a depth of about 60 inches is weakly cemented interbedded sandstone and shale. In places the surface layer is loam.

Included with these soils in mapping are small areas of the moderately well drained Humbird, somewhat poorly drained Merrillan, and poorly drained Veedum soils. Humbird soils are in positions on the landscape similar to those of the Hiles soil. They contain more sand in the upper part of the subsoil than the Hiles soil. Merrillan soils are in positions similar to those of the Kert soil. They

contain more sand in the upper part of the subsoil than the Kert soil. Veedum soils are in the lower positions on the landscape. Included soils make up 10 to 20 percent of the unit.

Permeability is moderate in the upper part of the subsoil in the Hiles and Kert soils. It is moderately slow or moderate in the lower part of the subsoil and extremely slow to moderately slow in the underlying interbedded sandstone and shale. The available water capacity is moderate in both soils. The content of organic matter is moderately low or moderate in the surface layer of the Hiles soil and moderate in the surface layer of the Kert soil. The surface layer of both soils is very friable and can be easily tilled, but it tends to crust and puddle after hard rains or forms hard clods if it is tilled when too wet. A perched seasonal high water table is at a depth of 1.5 to 3.0 feet in the Hiles soil and at a depth of 1.0 to 2.5 feet in the Kert soil. The rooting depth of most crops is limited by the seasonal high water table during wet periods of the growing season and by the interbedded sandstone and shale.

Most areas are used as cropland. Some areas are wooded. The Hiles soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If drained, the Kert soil is also suited to these crops. If cultivated crops are grown, water erosion is a slight or moderate hazard. It can be controlled by contour farming, contour stripcropping, conservation tillage, and grassed waterways. Land smoothing, surface drains, diversions, and tile drains help to remove excess water from the Kert soil. Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth, increases the rate of water infiltration, and reduces the hazard of erosion.

A cover of pasture plants is effective in controlling erosion. The surface layer is subject to crusting, which restricts the emergence of plants. Alfalfa is generally short lived because of the seasonal high water table and winterkill from frost heave. Overgrazing or grazing when the soils are wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, pasture rotation, measures that improve fertility, and restricted use during wet periods help to keep the pasture in good condition.

These soils are suited to trees. The equipment limitation on both soils and the windthrow hazard on the Kert soil are management concerns. Equipment use is restricted by the low strength of both soils and by wetness in areas of the Kert soil. These restrictions can be reduced by using equipment during dry periods or during periods when the surface is frozen or has adequate snow cover. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be strengthened with gravel or crushed rock. The log landings and haul roads can also be established in better suited included or adjacent areas. Culverts and ditches can be used to maintain natural drainage systems along haul roads. Harvesting by clearcut or area-selection methods helps to prevent windthrow of the remaining trees on the Kert soil. Natural seeding from unharvested trees promotes regeneration. Maintaining permanent all-season roads allows quick salvage of downed trees after periodic storms. Competing vegetation, which interferes with tree planting and natural regeneration after trees are harvested, can be controlled by herbicides or mechanical removal.

Because of the wetness, a thin layer over bedrock, and the restricted permeability, these soils are poorly suited to septic tank absorption fields. Mounding the site with suitable filtering material helps to overcome these limitations. Also, the effluent can be pumped to an absorption field on a better suited soil in nearby areas.

Because of the wetness and the shrink-swell potential, the Hiles soil is only moderately suited to dwellings without basements. The shrink-swell potential can be overcome by excavating the soil and replacing it with coarse textured material, such as sand and gravel. The wetness can be overcome by installing a subsurface drainage system with gravity outlets or other dependable outlets or by raising the site elevation with fill material.

Because of the wetness, the Hiles soil is poorly suited to dwellings with basements. Also, the Kert soil is poorly suited to all dwellings. The wetness can be overcome by constructing foundations on coarse textured fill material above the level of wetness and by installing tile drains around the foundations and providing gravity outlets or other dependable outlets.

Because of the wetness and the potential for shrinking and swelling, the Hiles soil is only moderately suited to local roads and streets. Because of the potential for frost action and the low strength, the Kert soil is poorly suited to local roads and streets. Installing a subsurface drainage system and replacing the upper part of the soil with coarse textured base material, such as sand or gravel, helps to overcome these limitations.

The land capability classification is IIw. The woodland ordination symbol is 4L (Northern red oak)

for the Hiles soil and 4W (Northern red oak) for the Kert soil. The forest habitat type commonly is ArCi for the Hiles soil and PVHa for the Kert soil.

HnB—Hixton loam, 2 to 6 percent slopes

This moderately deep, gently sloping, well drained soil is on summits of knolls and hills. Individual areas are irregular in shape and generally range from 5 to 80 acres in size.

Typically, the surface layer is dark brown loam about 8 inches thick. The subsoil is about 18 inches thick. It is dark brown and friable. The upper part is loam, and the lower part is sandy loam. The upper part of the substratum is strong brown sand about 10 inches thick. The lower part to a depth of about 60 inches is weakly cemented sandstone. In places the surface layer is silt loam. In some areas the slope is more than 6 percent.

Included with this soil in mapping are small areas of the well drained Elevasil, Gale, and Merit soils and the moderately well drained Merimod soils. Elevasil and Gale soils are in landscape positions similar to those of the Hixton soil. Elevasil soils have more sand in the surface layer and subsoil than the Hixton soil, and Gale soils have more silt and clay in the subsoil. Merit and Merimod soils are underlain by sand and are very deep. Merit soils are in positions on pediments similar to those of the Hixton soil. Merimod soils are in the lower positions on pediments. Included soils make up 5 to 15 percent of the unit.

Permeability is moderate in the loamy subsoil of the Hixton soil. It is rapid in the sandy residuum and moderately slow or moderate in the underlying sandstone. The available water capacity is moderate. The content of organic matter is moderately low in the surface layer. The surface layer is friable and can be easily tilled throughout a wide range in moisture content. The rooting depth of most crops is limited by the underlying sandstone.

Most areas are used as cropland. A few areas are used as pasture or woodland. This soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, water erosion is a slight or moderate hazard. It can be controlled by contour farming, contour stripcropping, conservation tillage, and grassed waterways. Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth, increases the rate of water infiltration, and reduces the hazard of erosion.

A cover of pasture plants is effective in controlling water erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, pasture rotation, measures that improve fertility, and restricted use during wet periods help to keep the pasture in good condition.

This soil is suited to trees. Equipment use on log landings and haul roads is restricted by low strength. Low strength can be overcome by using equipment during dry periods or during periods when the surface is frozen or has adequate snow cover. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be strengthened with gravel or crushed rock. The log landings and haul roads can also be established in more suitable included or adjacent areas. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal.

Because of a thin layer over bedrock and a poor filtering capacity, this soil is poorly suited to septic tank absorption fields. These limitations can result in the pollution of ground water. Mounding the site with suitable filtering material helps to overcome the limitations. Also, the effluent can be pumped to an absorption field on a better suited soil in nearby areas.

This soil is suited to dwellings. Because of the potential for frost action, it is only moderately suited to local roads and streets. Replacing the upper part of the soil with coarse textured base material, such as sand or gravel, helps to prevent the damage caused by frost action.

The land capability classification is IIe. The woodland ordination symbol is 4A (Northern red oak). The forest habitat type commonly is ArDe-V.

HnC2—Hixton loam, 6 to 12 percent slopes, eroded

This moderately deep, sloping, well drained soil is on the shoulders and back slopes of knolls, ridges, and hills. Individual areas are irregular in shape and generally range from 5 to 60 acres in size.

In most cultivated areas, erosion has removed much of the original surface layer. Typically, the remaining surface layer is dark brown loam about 9 inches thick. It is mixed with some dark yellowish brown subsoil material. The subsoil is about 23 inches thick. It is dark yellowish brown, friable loam in the upper part and dark yellowish brown, friable sandy loam in the lower part. The upper part of the

substratum is brownish yellow sand about 7 inches thick. The lower part to a depth of about 60 inches is weakly cemented sandstone. In places the surface layer is silt loam. In some areas the slope is less than 6 percent or more than 12 percent.

Included with this soil in mapping are small areas of the well drained Elevasil, Gale, Gardenvale, and Merit soils and the moderately well drained Merimod soils. Elevasil, Gale, and Gardenvale soils are in landscape positions similar to those of the Hixton soil. Elevasil soils have more sand in the surface layer and subsoil than the Hixton soil, and Gale soils have more silt and clay in the subsoil. Gardenvale soils are deep to weakly cemented sandstone. Merit soils are in positions on pediments similar to those of the Hixton soil. They are underlain by sand and are very deep. Merimod soils are in the lower positions on pediments. They are underlain by sand. Included soils make up 5 to 15 percent of the unit.

Permeability is moderate in the loamy subsoil of the Hixton soil. It is rapid in the sandy residuum and moderately slow or moderate in the underlying sandstone. The available water capacity is moderate. The content of organic matter is moderately low in the surface layer. The surface layer is friable and can be easily tilled throughout a wide range in moisture content. The rooting depth of most crops is limited by the underlying sandstone.

Most areas are used as cropland or pasture. A few areas are wooded. This soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, water erosion is a moderate hazard. It can be controlled by contour farming, contour stripcropping, conservation tillage, and grassed waterways. Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth, increases the rate of water infiltration, and reduces the hazard of water erosion.

A cover of pasture plants is effective in controlling water erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, pasture rotation, measures that improve fertility, and restricted use during wet periods help to keep the pasture in good condition.

This soil is suited to trees. Equipment use is restricted by the slope at log landings and by low strength at log landings and on haul roads. Log landings can be established in nearly level or gently sloping included or adjacent areas. Low strength can be overcome by using equipment during dry periods or during periods when the surface is frozen or has adequate snow cover. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be strengthened with gravel or crushed rock. The log landings and haul roads can also be established in better suited included or adjacent areas. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal.

Because of a thin layer over bedrock and a poor filtering capacity, this soil is poorly suited to septic tank absorption fields. These limitations can result in the pollution of ground water. Mounding the site with suitable filtering material helps to overcome the limitations. Also, the effluent can be pumped to an absorption field on a better suited soil in nearby areas.

Because of the slope, this soil is only moderately suited to dwellings. This limitation can be overcome by cutting and filling, by installing retaining walls, or by designing the dwellings so that one side of the basement fronts on the lower part of the slope. Also, the dwellings can be constructed in the less sloping included areas.

Because of the slope and the potential for frost action, this soil is only moderately suited to local roads and streets. The slope can be overcome by shaping the roadway through cutting and filling. Also, the roads can be built in the less sloping areas. Replacing the upper part of the soil with coarse textured base material, such as sand or gravel, helps to prevent the damage caused by frost action.

The land capability classification is IIIe. The woodland ordination symbol is 4A (Northern red oak). The forest habitat type commonly is ArDe-V.

HnD2—Hixton loam, 12 to 20 percent slopes, eroded

This moderately deep, moderately steep, well drained soil is on shoulders, back slopes, nose slopes, and the upper foot slopes of hills and ridges. Individual areas are irregular in shape and generally range from 5 to 60 acres in size.

In most cultivated areas, erosion has removed much of the original surface layer. Typically, the remaining surface layer is dark brown loam about 8 inches thick. It is mixed with some dark yellowish brown subsoil material. The subsoil is about 18 inches thick. The upper part is dark yellowish brown, friable loam, and the lower part is yellowish brown,

friable sandy loam. The upper part of the substratum is yellowish brown sand about 6 inches thick. The lower part to a depth of about 60 inches is weakly cemented sandstone. In places the surface layer is silt loam. In some areas the slope is less than 12 percent or more than 20 percent.

Included with this soil in mapping are small areas of the well drained Council, Elevasil, and Gale soils. These soils are in landscape positions similar to those of the Hixton soil. Council soils are loamy throughout and are very deep. Elevasil soils have more sand in the surface layer than the Hixton soil, and Gale soils have more silt and clay in the subsoil. Included soils make up 5 to 15 percent of the unit.

Permeability is moderate in the loamy subsoil of the Hixton soil. It is rapid in the sandy residuum and moderately slow or moderate in the underlying sandstone. The available water capacity is moderate. The content of organic matter is moderately low in the surface layer. The surface layer is friable and can be easily tilled throughout a wide range in moisture content. The rooting depth of most crops is limited by the underlying sandstone.

Most areas are used as cropland or pasture. A few areas are wooded. This soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, water erosion is a moderate hazard. It can be controlled by contour farming, contour stripcropping, crop rotations that include grasses and legumes, conservation tillage, and grassed waterways. Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth, increases the rate of water infiltration, and reduces the hazard of water erosion.

A cover of pasture plants is effective in controlling water erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, pasture rotation, measures that improve fertility, and restricted use during wet periods help to keep the pasture in good condition.

This soil is suited to trees. The erosion hazard and the equipment limitation are management concerns. Erosion is accelerated where runoff is concentrated on skid trails, log landings, and haul roads. Removing water with water bars, establishing out-sloping road surfaces, crowning the road surfaces, providing ditches and culverts, and establishing skid trails and haul roads on the contour minimize erosion. Erosion also can be controlled by seeding areas where logging has exposed the surface.

Equipment use is restricted by the slope on skid trails and by the slope and low strength at log landings and on haul roads. Skid trails and haul roads can be designed so that they conform to the topography and so that grades are kept as low as possible. Log landings can be established in nearly level or gently sloping included or adjacent areas. Low strength can be overcome by using the equipment during dry periods or during periods when the surface is frozen or has adequate snow cover. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be strengthened with gravel or crushed rock. The log landings and haul roads can also be established in better suited included or adjacent areas. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal.

Because of a thin layer over bedrock, a poor filtering capacity, and the slope, this soil generally is poorly suited to septic tank absorption fields. It readily absorbs but does not adequately filter the effluent. The poor filtering capacity can result in the pollution of ground water. The thin layer and the poor filtering capacity can be overcome by mounding the site with suitable filtering material. The slope can be overcome by cutting and filling or by installing a trench absorption system on the contour.

Because of the slope, this soil is poorly suited to dwellings. This limitation can be overcome by cutting and filling, by installing retaining walls, or by designing the dwellings so that one side of the basement fronts on the lower part of the slope. Also, the dwellings can be constructed in the less sloping included areas.

Because of the slope, this soil is poorly suited to local roads and streets. The slope can be overcome by shaping the roadway through cutting and filling. Also, the roads can be built in the less sloping included areas.

The land capability classification is IVe. The woodland ordination symbol is 4R (Northern red oak). The forest habitat type commonly is ArDe-V.

HpA—Hoop sandy loam, 0 to 3 percent slopes

This very deep, nearly level and gently sloping, somewhat poorly drained soil is in drainageways and depressions. Individual areas are irregular in shape and range from about 4 to 40 acres in size.

Typically, the surface layer and the subsurface

layer are very dark grayish brown sandy loam about 11 inches thick. The subsoil is mottled, friable sandy loam about 13 inches thick. It is dark yellowish brown in the upper part and grayish brown in the lower part. The substratum to a depth of about 60 inches is brownish yellow and light brownish gray, mottled sand. In places the surface layer is thinner and lighter colored.

Included with this soil in mapping are small areas of the moderately well drained Bilmod and somewhat poorly drained Sooner soils. Bilmod soils are in the slightly higher positions on the landscape. Sooner soils are in positions similar to those of the Hoop soil. They have more clay in the subsoil than the Hoop soil. Also included are small areas of poorly drained sandy loam. These areas are in the slightly lower landscape positions. Included areas make up 5 to 15 percent of the unit.

Permeability is moderate in the loamy mantle in the Hoop soil and rapid or very rapid in the sandy alluvium. The available water capacity is low. The content of organic matter is moderate in the surface layer. The surface layer is friable and can be easily tilled throughout a wide range in moisture content. An apparent seasonal high water table is at a depth of 1 to 2 feet. The rooting depth of most crops is limited by the seasonal high water table during wet periods of the growing season.

Most areas are used as cropland. A few areas are used for pasture or are wooded. This soil is not naturally forested and is not generally managed for woodland. If it is drained, the soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Land smoothing, a surface drainage system, diversions, and interception drains help to remove excess water. If tile drainage is installed, fine sand enters the tile lines unless a suitable filter is used to cover the tile. If the water table is excessively lowered, however, crop yields are limited by a low available water capacity. If irrigated, the soil is also suited to vegetables, such as snap beans, potatoes, sweet corn, and peas. In cultivated areas, it is subject to soil blowing. Applying a system of conservation tillage, wind stripcropping, and returning crop residue or other organic material to the soil help to maintain fertility and good tilth, increase the rate of water infiltration, and reduce the hazard of soil blowing.

This soil is suited to pasture. A cover of pasture plants is effective in controlling soil blowing. Alfalfa is generally short lived because of the seasonal high water table and winterkill from frost heave. Red clover is generally grown. Overgrazing or grazing when the soil is wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, measures that improve fertility, pasture rotation, and restricted use during wet periods help to keep the pasture in good condition.

Because of the wetness and a poor filtering capacity in the substratum, this soil is poorly suited to septic tank absorption fields. The soil readily absorbs the effluent in septic tank absorption fields. It does not adequately filter the effluent, however, because of the rapid permeability. The poor filtering capacity can result in the pollution of ground water. Mounding the site with suitable filtering material helps to overcome the wetness and the poor filtering capacity. Also, the effluent can be pumped to an absorption field on a better suited soil in nearby areas.

Because of the wetness, this soil is poorly suited to dwellings. This limitation can be overcome by installing tile drains around foundations and providing gravity outlets or other dependable outlets and by constructing the foundations on coarse textured fill material above the level of wetness.

Because of the wetness and the potential for frost action, this soil is poorly suited to local roads and streets. Installing a subsurface drainage system and replacing the upper part of the soil with a coarse textured base material, such as sand or gravel, helps to overcome these limitations.

The land capability classification is IIIw. No woodland ordination symbol or forest habitat type is assigned.

Ht—Houghton muck, 0 to 1 percent slopes

This very deep, nearly level, very poorly drained soil is on flood plains along small rivers and streams. It is subject to frequent flooding for long periods. Individual areas are long and narrow or irregularly shaped and generally range from 5 to 100 acres in size.

Typically, the organic layers extend to a depth of more than 51 inches. They are mostly very dark brown and black muck. In places the organic layers are mostly mucky peat or peat.

Included with this soil in mapping are small areas of the very poorly drained Adder soils and areas of very poorly drained silty alluvium underlain by organic material. These soils are in positions on the landscape similar to those of the Houghton soil. Adder soils have a sandy substratum. Included soils make up 5 to 15 percent of the unit.

Permeability is moderately slow to moderately rapid in the Houghton soil. The available water capacity and the organic matter content are very high. The rooting depth of most plants is limited by the apparent seasonal high water table, which is near or above the surface in undrained areas.

Most areas support wetland vegetation. Because of the wetness, frequent flooding, and the hazard of frost late in spring and early in fall, this soil is generally not suited to cultivated crops or to pasture. If drained and cultivated, it is subject to burning, subsidence, and soil blowing.

In most areas, this soil is not suited to trees. Generally, trees grow poorly, are poorly shaped, and are barely merchantable. In a few areas that are naturally drained by stream entrenchment, the soil is suited to trees. Overcoming the limitations affecting management is difficult, however, and a more suitable site should be selected.

This soil generally is not suitable as a site for septic tank absorption fields, dwellings, or local roads and streets, mainly because of the wetness, the flooding, the subsidence, and low strength. Overcoming these limitations is difficult. A better suited site should be considered.

The land capability classification is VIIIw in undrained areas. No woodland ordination symbol or forest habitat type is assigned.

HuB—Humbird fine sandy loam, 1 to 6 percent slopes

This moderately deep, gently sloping, moderately well drained soil is on summits and shoulders of low knolls. Individual areas are irregular in shape and generally range from 5 to 120 acres in size.

Typically, the surface layer is very dark brown fine sandy loam about 8 inches thick. The subsurface layer is dark grayish brown fine sandy loam about 4 inches thick. The subsoil is about 22 inches thick. The upper part is brown and dark yellowish brown, friable fine sandy loam. The next part is olive gray, mottled, friable fine sandy loam. The lower part is light olive gray, mottled, firm silty clay. Weakly cemented interbedded sandstone and shale is at a depth of about 34 inches. In places the surface layer is sandy loam.

Included with this soil in mapping are small areas of the moderately well drained Ludington and somewhat poorly drained Merrillan soils. Ludington soils are in positions on the landscape similar to those of the Humbird soil. They have more sand in the surface layer and subsoil than the Humbird soil. Merrillan soils are in the slightly lower positions. Included soils make up 5 to 15 percent of the unit.

Permeability is moderate or moderately rapid in the loamy upper part of the subsoil in the Humbird soil. It is slow in the clayey lower part of the subsoil and extremely slow to moderately slow in the underlying interbedded sandstone and shale. The available water capacity is low. The content of organic matter is moderately low or moderate in the surface layer. The surface layer is friable and can be easily tilled throughout a wide range in moisture content. A seasonal high water table is perched at a depth of 1.5 to 3.0 feet. The rooting depth of most crops is limited by the seasonal high water table during wet periods of the growing season or by the underlying interbedded sandstone and shale.

Most areas are used as cropland or pasture. A few areas are wooded. This soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. In most years crop yields are limited by the low available water capacity. If irrigated, the soil is also suited to vegetables, such as snap beans, potatoes, sweet corn, and peas. If cultivated crops are grown, water erosion is a slight or moderate hazard. Also, the soil is subject to soil blowing. Contour farming, contour stripcropping, winter cover crops, field windbreaks, conservation tillage, and grassed waterways help to prevent excessive soil loss. Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth, increases the rate of water infiltration, and helps to control erosion and soil blowing.

A cover of pasture plants is effective in controlling water erosion and soil blowing. Overgrazing or grazing when the soil is too wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, pasture rotation, and measures that improve fertility help to keep the pasture in good condition.

This soil is suited to trees. Equipment use is restricted by low strength. This restriction can be reduced by using equipment during dry periods or during periods when the surface is frozen or has adequate snow cover. Equipment with flotation tires or with tracks has better traction than wheeled equipment. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be strengthened with gravel or crushed rock. The log landings and haul roads can also be established in better suited included or adjacent areas. Competing

vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or mechanical removal.

Because of a thin layer over bedrock, wetness, and the restricted permeability, this soil is poorly suited to septic tank absorption fields. Mounding the site with suitable filtering material helps to overcome these limitations. Also, the effluent can be pumped to an absorption field on a better suited soil in nearby areas.

Because of the wetness, this soil is only moderately suited to dwellings without basements and is poorly suited to dwellings with basements. The wetness can be overcome by installing a subsurface drainage system with gravity outlets or other dependable outlets or by adding fill to raise the elevation of the site.

Because of the wetness and the potential for frost action, this soil is only moderately suited to local roads and streets. Excavating and replacing the soil with coarse textured base material, such as sand or gravel, help to prevent the damage caused by wetness and by frost action.

The land capability classification is IIe. The woodland ordination symbol is 4L (Northern red oak). The primary forest habitat type commonly is ArDe-V, and the secondary forest habitat type is PVHa.

HxB—Humbird-Merrillan fine sandy loams, 0 to 6 percent slopes

These moderately deep soils are nearly level and gently sloping. The moderately well drained Humbird soil is on the gently sloping summits and shoulders of knolls. The somewhat poorly drained Merrillan soil is on toe slopes. The Humbird and Merrillan soils occur as areas so intricately mixed or so small that it was not practical to map them separately. Individual areas are irregular in shape and generally range from 5 to 450 acres in size. They are about 35 to 45 percent Humbird soil and 35 to 45 percent Merrillan soil.

Typically, the surface layer of the Humbird soil is black fine sandy loam about 2 inches thick. It is covered by about 1 inch of very dark grayish brown mucky peat, which is a mat of partially decomposed forest litter. The subsurface layer is grayish brown fine sandy loam about 3 inches thick. The subsoil is about 24 inches thick. The upper part is dark brown, very friable fine sandy loam. The next part is reddish brown, firm silty clay. The lower part is light olive gray, mottled, firm silty clay. The substratum to a depth of about 60 inches is weakly cemented interbedded sandstone and shale. In places the surface layer is sandy loam. In some areas the slope is more than 6 percent.

Typically, the surface layer of the Merrillan soil is black fine sandy loam about 2 inches thick. It is covered by about 1 inch of very dark grayish brown mucky peat, which is a mat of partially decomposed forest litter. The subsurface layer is pinkish gray fine sandy loam about 2 inches thick. The subsoil is about 25 inches thick. It is dark brown, friable fine sandy loam in the upper part; light yellowish brown and very pale brown, friable fine sandy loam in the next part; and light gray, mottled, firm clay loam in the lower part. The substratum to a depth of about 60 inches is weakly cemented interbedded sandstone and shale. In places the surface layer is sandy loam or loam.

Included with these soils in mapping are small areas of the somewhat poorly drained Fairchild, moderately well drained Ludington, and poorly drained Veedum soils. Also included are small areas that have slopes of more than 6 percent. Fairchild soils are in positions on the landscape similar to those of the Merrillan soil. They are sandy in the upper part of the subsoil. Ludington soils are in positions similar to those of the Humbird soil. They are sandy in the upper part of the profile. Veedum soils are in the lower landscape positions. Included soils make up 10 to 25 percent of the unit.

Permeability is moderate or moderately rapid in the loamy upper part of the subsoil in the Humbird and Merrillan soils. It is slow in the clayey lower part of the subsoil and extremely slow to moderately slow in the underlying interbedded sandstone and shale. The available water capacity is low in both soils. The content of organic matter is moderately low or moderate in the surface layer of the Humbird soil and moderate or high in the surface layer of the Merrillan soil. A perched seasonal high water table is at a depth of 1.5 to 3.0 feet in the Humbird soil and at a depth of 1.0 to 2.0 feet in the Merrillan soil. The rooting depth of most crops is limited by the seasonal high water table during wet periods of the growing season and by the interbedded sandstone and shale.

Most areas are wooded. A few areas are used as cropland. If drained, these soils are suited to corn, soybeans, and small grain. The soils are suited to grasses and legumes for hay and pasture. In most years crop yields are limited by the low available water capacity. Irrigation improves the suitability of these soils for most crops. If cultivated crops are grown, water erosion is a slight or moderate hazard. Also, the soils are subject to soil blowing. Contour farming, contour stripcropping, winter cover crops, field windbreaks, conservation tillage, and grassed

waterways help to prevent excessive soil loss. Land smoothing, surface drains, diversions, and interceptor subsurface drains are needed to help remove excess water in areas of the Merrillan soil. Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth, increases the rate of water infiltration, and reduces the hazard of erosion.

A cover of pasture plants is effective in controlling erosion and soil blowing. Alfalfa is generally short lived because of the seasonal high water table and winterkill from frost heave. Red clover generally is grown. Overgrazing or grazing when the soils are wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, pasture rotation, measures that improve fertility, and restricted use during wet periods help to keep the pasture in good condition.

These soils are suited to trees. The equipment limitation on both soils and the windthrow hazard on the Merrillan soil are management concerns. Equipment use is restricted by the low strength of both soils and by the wetness in areas of the Merrillan soil. These restrictions can be reduced by using equipment during dry periods or during periods when the surface is frozen or has adequate snow cover. Equipment with flotation tires or with tracks has better traction than wheeled equipment. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be strengthened with gravel or crushed rock. The log landings and haul roads can also be established in better suited included or adjacent areas. Culverts and ditches can be used to maintain natural drainage systems along haul roads. Harvesting by clearcut or area-selection methods helps to prevent windthrow of the remaining trees on the Merrillan soil. Natural seeding from unharvested trees promotes regeneration. Maintaining permanent all-season roads allows quick salvage of downed trees after periodic storms. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or mechanical removal.

Because of a thin layer over bedrock, wetness, and the restricted permeability, these soils are poorly suited to septic tank absorption fields. Mounding the site with suitable filtering material helps to overcome these limitations. Also, the effluent can be pumped to an absorption field on a better suited soil in nearby areas.

Because of the wetness, the Humbird soil is only moderately suited to dwellings without basements and is poorly suited to dwellings with basements. The Merrillan soil is poorly suited to all dwellings. The wetness can be overcome by installing a subsurface drainage system with gravity outlets or other dependable outlets or by adding fill to raise the elevation of the site.

Because of the wetness and the potential for frost action, the Humbird soil is only moderately suited to local roads and streets. Because of the low strength, the wetness, and the potential for frost action, the Merrillan soil is poorly suited to local roads and streets. Using a coarse textured fill material, replacing the soil with coarse textured base material, such as sand or gravel, and installing a subsurface drainage system help to prevent the damage caused by wetness and by frost action. Increasing the thickness of the pavement or base material also helps to overcome the low strength of the Merrillan soil.

The land capability classification is IIw. The woodland ordination symbol is 4L (Northern red oak) for the Humbird soil and 4W (Northern red oak) for the Merrillan soil. The forest habitat type commonly is ArDe-V for the Humbird soil and PVHa for the Merrillan soil.

ImA—Impact sand, 0 to 3 percent slopes

This very deep, nearly level and gently sloping, excessively drained soil is on toe slopes and low knolls. Individual areas are irregular in shape and generally range from 4 to 200 acres in size.

Typically, the surface layer is very dark grayish brown sand about 6 inches thick. The subsurface layer is about 8 inches thick. It is very dark grayish brown sand in the upper part and dark brown sand in the lower part. The subsoil is dark brown and strong brown, very friable sand about 16 inches thick. The substratum to a depth of about 60 inches is brownish yellow sand. In places the surface layer is loamy sand, fine sand, or loamy fine sand. In some areas the substratum has thin bands of reddish or brownish sandy or loamy material.

Included with this soil in mapping are small areas of the moderately well drained Bilmod, well drained Bilson, somewhat excessively drained Gosil, and excessively drained Tarr soils. Bilson, Gosil, and Tarr soils are in positions on the landscape similar to those of the Impact soil. Bilson soils have more silt and clay in the surface layer and subsoil than the Impact soil, and Gosil soils have slightly more silt and clay in the subsoil. Tarr soils have a thinner and lighter colored surface layer than the Impact soil.

Bilmod soils are in the slightly lower positions on the landscape. They have more silt and clay in the surface layer and subsoil than the Impact soil. Included soils make up 5 to 15 percent of the unit.

Permeability is rapid in the Impact soil. The available water capacity is low. The content of organic matter is moderately low in the surface layer. The surface layer is very friable and can be easily tilled throughout a wide range in moisture content.

Most areas are used as cropland. A few areas are wooded, and some areas have been planted to pine trees. This soil is poorly suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. In most years crop yields are limited by the low available water capacity. If irrigated, the soil is suited to the commonly grown farm crops and to vegetables, such as snap beans and sweet corn. If cultivated crops are grown, the soil is subject to soil blowing. Winter cover crops, conservation tillage, wind stripcropping, and field windbreaks help to prevent excessive soil loss. Returning crop residue to the soil or adding other organic material reduces the hazard of soil blowing and the amount of water lost through evaporation, increases the rate of water infiltration, and helps to maintain fertility and soil tilth.

A cover of pasture plants is effective in controlling soil blowing and water erosion. Forage yields are generally low unless fertilizer is applied and the supply of moisture is adequate. Planting early in the spring, before the soil has a chance to dry, helps to overcome the droughtiness. Later plantings are likely to have a poor survival rate. Overgrazing can cause surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Measures that improve fertility, proper stocking rates, and pasture rotation help to keep the pasture in good condition.

This soil is suited to pine trees. Hardwood trees grow slowly and are poorly shaped. The equipment limitations and seedling mortality are management concerns. Equipment use is restricted by the loose sand. This restriction can be reduced by using equipment when the surface is frozen. Equipment with flotation tires or with tracks has better traction in loose sand than standard wheeled equipment. Sandy areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be stabilized by gravel or crushed rock. The log landings and haul roads can also be established in better suited included or adjacent areas. Seedling mortality caused by droughtiness can be reduced by careful planting of containerized seedlings or vigorous nursery stock. It can also be reduced by planting when the soil is moist. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal.

This soil is suited to dwellings and to local roads and streets. The soil readily absorbs the effluent in septic tank absorption fields, but it does not adequately filter the effluent because of the rapid permeability. The poor filtering capacity can result in the pollution of ground water.

The land capability classification is IVs. The woodland ordination symbol is 5S (Jack pine). The primary forest habitat type commonly is PVGy, and the secondary forest habitat type is PVCr.

IrA—Ironrun sand, 0 to 3 percent slopes

This very deep, nearly level and gently sloping, somewhat poorly drained soil is on the lower toe slopes and in slight depressions. Individual areas are irregular in shape and generally range from 10 to 500 acres in size.

Typically, the surface layer is black sand about 2 inches thick. It is covered by about 2 inches of very dark grayish brown mucky peat, which is a mat of partially decomposed forest litter. The subsurface layer is pinkish gray sand about 12 inches thick. The subsoil is dark reddish brown and brown, mottled, very friable sand about 23 inches thick. The substratum to a depth of about 60 inches is pale brown, mottled sand. In places the surface layer is loamy sand or coarse sand. In some areas the subsoil or substratum has layers of grayish brown loamy sand or sand.

Included with this soil in mapping are small areas of the moderately well drained Rockdam and poorly drained Ponycreek soils. Rockdam soils are in the slightly higher positions on the landscape. Ponycreek soils are in the lower positions. Included soils make up 10 to 15 percent of the unit.

Permeability is rapid or very rapid in the Ironrun soil. The available water capacity is low. The content of organic matter is moderate or high in the surface layer. The surface layer is very friable and can be easily tilled throughout a wide range in moisture content. An apparent seasonal high water table is at a depth of 1 to 2 feet in undrained areas. The rooting depth of most crops is limited by the seasonal high water table during wet periods of the growing season.

Most areas are wooded. A few areas are used as cropland or pasture. Areas of idle cropland are reverting to woodland. This soil is suited to trees. The

equipment limitation, seedling mortality, and the windthrow hazard are management concerns. Equipment use is restricted by the wetness, the loose sand, and low soil strength. These restrictions can be reduced by using equipment during dry periods or during periods when the surface is frozen or has adequate snow cover. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be strengthened with gravel or crushed rock. The log landings and haul roads can also be established in better suited included or adjacent areas. Culverts and ditches can be used to maintain natural drainage systems along haul roads. Seedling mortality caused by seasonal droughtiness can be reduced by careful planting of vigorous nursery stock or containerized seedlings and by planting when the soil is moist. Harvesting by clearcut or area-selection methods helps to prevent windthrow of the remaining trees. Natural seeding from unharvested trees promotes regeneration. Maintaining permanent all-season roads allows quick salvage of downed trees after periodic storms. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal.

Because of wetness and a poor filtering capacity, this soil is poorly suited to septic tank absorption fields. These limitations can result in the pollution of ground water. Mounding the site with suitable filtering material helps to overcome the limitations. Also, the effluent can be pumped to an absorption field on a better suited soil in nearby areas.

Because of the wetness, this soil is poorly suited to dwellings. This limitation can be overcome by installing tile drains around foundations and providing gravity outlets or other dependable outlets and by constructing the foundations on coarse textured fill material above the level of wetness.

Because of the wetness and the potential for frost action, this soil is poorly suited to local roads and streets. Installing a subsurface drainage system and replacing the upper part of the soil with coarse textured base material, such as sand or gravel, helps to prevent the damage caused by wetness and by frost action.

The land capability classification is IVw. The woodland ordination symbol is 6W (Quaking aspen). The primary forest habitat type commonly is PVHa, and the secondary forest habitat type is PVRh.

IxA—Ironrun-Ponycreek complex, 0 to 3 percent slopes

These very deep soils are nearly level and gently sloping. The somewhat poorly drained Ironrun soil is on the lower toe slopes and in slight depressions. The poorly drained Ponycreek soil is in depressions. The Ironrun and Ponycreek soils occur as areas so intricately mixed or so small that it was not practical to map them separately. Individual areas are irregular in shape and generally range from 40 to 1,000 acres in size. They are about 45 to 55 percent Ironrun soil and 30 to 40 percent Ponycreek soil.

Typically, the surface layer of the Ironrun soil is black sand about 2 inches thick. It is covered by about 2 inches of very dark grayish brown mucky peat, which is a mat of partially decomposed forest litter. The subsurface layer is gray sand about 8 inches thick. The subsoil is very friable sand about 18 inches thick. It is dark reddish brown in the upper part and mottled reddish brown and dark brown in the lower part. The substratum to a depth of about 60 inches is yellow, mottled sand. In places the surface layer is loamy sand or coarse sand. In some areas the subsoil or substratum has layers of grayish or reddish loamy sand or sand.

Typically, the surface layer of the Ponycreek soil is black muck about 4 inches thick. The subsurface layer is black mucky sand about 2 inches thick. The subsoil is dark grayish brown and grayish brown, mottled, very friable sand about 23 inches thick. The substratum to a depth of about 60 inches is light yellowish brown sand. In places the surface layer is mucky sand or mucky coarse sand. In some areas the upper part of the subsoil is reddish brown. In other areas the substratum has thin strata of silt loam, loam, or sandy loam.

Included with these soils in mapping are small areas of the very poorly drained Dawsil, poorly drained Elm Lake, and moderately well drained Rockdam soils. Dawsil and Elm Lake soils are in positions on the landscape similar to those of the Ponycreek soil. Dawsil soils formed in 16 to 51 inches of organic material. Elm Lake soils formed in sandy deposits underlain by loamy material weathered from interbedded sandstone and shale. Rockdam soils are in the slightly higher positions on the landscape. Included soils make up 5 to 20 percent of the unit.

Permeability is rapid or very rapid in the Ironrun and Ponycreek soils. The available water capacity is low. The content of organic matter is moderate or high in the surface layer of the Ironrun soil and very

high in the surface layer of the Ponycreek soil. The surface layer of both soils is very friable and can be easily tilled throughout a wide range in moisture content. An apparent seasonal high water table is at a depth of 1 to 2 feet in the Ironrun soil and is above or near the surface in the Ponycreek soil. The rooting depth of most crops is limited by the seasonal high water table.

Most areas of these soils are wooded or support wetland vegetation. Most areas of idle cropland or pasture are reverting to woodland.

The Ironrun soil is suited to trees. The Ponycreek soil is poorly suited to most trees, but it is somewhat suited to some conifers. The equipment limitation, seedling mortality, and the windthrow hazard are management concerns in areas of both soils.

Equipment use is restricted by the wetness in areas of both soils and by low strength and loose sand in areas of the Ironrun soil. These restrictions can be reduced by using equipment during dry periods or during periods when the surface is frozen or has adequate snow cover. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be strengthened with gravel or crushed rock. The log landings and haul roads can also be established in better suited included or adjacent areas. Culverts and ditches can be used to maintain natural drainage systems along haul roads. Seedling mortality caused by seasonal droughtiness in areas of the Ironrun soil can be reduced by careful planting of vigorous nursery stock or containerized seedlings and by planting when the soil is moist. Seedling mortality caused by the seasonal wetness in areas of the Ponycreek soil can be reduced by careful machine planting of vigorous nursery stock on prepared ridges or by hand planting on cradle knolls and in the drier included areas. Harvesting by clearcut or area-selection methods helps to prevent windthrow of the remaining trees. Natural seeding from unharvested trees promotes regeneration. Maintaining permanent all-season roads allows quick salvage of downed trees after periodic storms. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal.

Because of the wetness and a poor filtering capacity, the Ironrun soil is poorly suited to septic tank absorption fields. These limitations can result in the pollution of ground water. Mounding the site with suitable filtering material helps to overcome the limitations. Also, the effluent can be pumped to an absorption field on a better suited soil in nearby areas. Because of the ponding and a poor filtering capacity, the Ponycreek soil is not suitable as a site for septic tank absorption fields. Overcoming these limitations is difficult. A better suited site should be considered.

Because of the wetness, the Ironrun soil is poorly suited to dwellings. This limitation can be overcome by installing tile drains around foundations and providing gravity outlets or other dependable outlets and by constructing the foundations on coarse textured fill material above the level of wetness. Because of the ponding, the Ponycreek soil is generally not suitable as a site for dwellings. Overcoming the ponding is difficult. A better suited site should be considered.

Because of the wetness and the potential for frost action, the Ironrun soil is poorly suited to local roads and streets. Installing a subsurface drainage system and replacing the upper part of the soil with coarse textured base material, such as sand or gravel, helps to prevent the damage caused by wetness and by frost action. Because of the ponding, the Ponycreek soil generally is not suitable as a site for local roads and streets. Overcoming the ponding is difficult. A better suited site should be considered.

The land capability classification in undrained areas is VIw. The woodland ordination symbol is 6W (Quaking aspen) for the Ironrun soil and 6W (Jack pine) for the Ponycreek soil. The primary forest habitat type for the Ironrun soil commonly is PVHa, and the secondary forest habitat type is PVRh. No forest habitat type is assigned for the Ponycreek soil.

IzB—Ironrun-Ponycreek-Arbutus complex, 0 to 6 percent slopes

These moderately deep and very deep soils are nearly level and gently sloping. The somewhat poorly drained Ironrun soil is in slight depressions. The poorly drained Ponycreek soil is in depressions and drainageways. The excessively drained Arbutus soil is on knolls. The Ironrun, Ponycreek, and Arbutus soils occur as areas so intricately mixed or so small that it was not practical to map them separately. Individual areas are irregular in shape and generally range from 40 to 100 acres in size. They are about 30 to 40 percent Ironrun soil, 25 to 35 percent Ponycreek soil, and 15 to 25 percent Arbutus soil.

Typically, the surface layer of the Ironrun soil is very dark gray sand about 3 inches thick. It is covered by about 2 inches of very dark grayish brown mucky peat (hemic material), which is a mat

of partially decomposed forest litter. The subsurface layer is grayish brown sand about 4 inches thick. The subsoil is very friable sand about 16 inches thick. It is dark brown in the upper part and brownish yellow and mottled in the lower part. The substratum to a depth of about 60 inches is brownish yellow and yellow, mottled sand. In places the surface layer is loamy sand or coarse sand. In some areas the subsoil or substratum has layers of grayish or reddish loamy sand or sand.

Typically, the surface layer of the Ponycreek soil is black muck about 3 inches thick. The subsurface layer is black mucky sand about 3 inches thick. The subsoil is brown, mottled sand about 20 inches thick. The substratum to a depth of about 60 inches is light brownish gray and very pale brown, mottled sand. In places the surface layer is muck or mucky coarse sand. In some areas the upper part of the subsoil is reddish brown.

Typically, the surface layer of the Arbutus soil is very dark grayish brown loamy sand about 2 inches thick. It is covered by about 1 inch of very dark grayish brown mucky peat, which is a mat of partially decomposed forest litter. The subsurface layer is grayish brown loamy sand about 3 inches thick. The subsoil is about 26 inches thick. It is dark brown, very friable sand in the upper part and brown and yellowish brown, loose sand in the lower part. Igneous bedrock is at a depth of about 32 inches. In places the surface layer is sand.

Included with these soils in mapping are small areas of the very poorly drained Dawsil and moderately well drained Rockdam soils. Also included are small areas of rock outcrop and areas that have stones and boulders on the surface. Dawsil soils are in positions on the landscape similar to those of the Ponycreek soil. They formed in 16 to 51 inches of organic material. Rockdam soils are slightly higher on the landscape than the Ironrun soil. Included areas make up 5 to 20 percent of the unit.

Permeability is rapid or very rapid in the Ironrun and Ponycreek soils. It is rapid in the sandy mantle of the Arbutus soil and rapid to very slow in the underlying bedrock. The available water capacity is low in all three soils. The content of organic matter is moderate or high in the surface layer of the Ironrun soil, very high in the surface layer of the Ponycreek soil, and low or moderately low in the surface layer of the Arbutus soil. The surface layer of all three soils is very friable and can be easily tilled throughout a wide range in moisture content. An apparent seasonal high water table is at a depth of 1 to 2 feet in the Ironrun soil and is above or near the surface in the Ponycreek soil. The rooting depth of most crops is limited by the seasonal high water table in the Ironrun and Ponycreek soils and by the underlying bedrock in the Arbutus soil.

Most areas of these soils are wooded. The Ironrun and Arbutus soils are suited to trees. The Ponycreek soil is suited to some conifers but is poorly suited to most other trees. The equipment limitation and seedling mortality are management concerns on these soils. Also, windthrow is a hazard on the Ironrun and Ponycreek soils.

Equipment use is restricted by wetness in areas of the Ironrun and Ponycreek soils and by low strength in areas of the Ironrun soil. It is also restricted by loose sand in areas of the Arbutus and Ironrun soils and by the depth to rock in areas of the Arbutus soil. Most of these restrictions can be reduced by using equipment during dry periods or during periods when the surface is frozen or has adequate snow cover. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Areas used for log landings and haul roads can be strengthened with gravel or crushed rock. The log landings and haul roads can also be established in better suited included or adjacent areas. Culverts and ditches can be used to maintain natural drainage systems along haul roads. Seedling mortality caused by seasonal droughtiness in areas of the Ironrun and Arbutus soils can be reduced by careful planting of vigorous nursery stock or containerized seedlings and by planting when the soils are moist. Seedling mortality caused by seasonal wetness in areas of the Ponycreek soil can be reduced by careful machine planting of vigorous nursery stock on prepared ridges or by hand planting on cradle knolls and in the drier included areas. Harvesting by clearcut or area-selection methods helps to prevent windthrow of the remaining trees. Natural seeding from unharvested trees promotes regeneration. Maintaining permanent all-season roads allows quick salvage of downed trees after periodic storms. Competing vegetation, which interferes with tree planting and natural regeneration following harvest in areas of the Ironrun and Ponycreek soils, can be controlled by herbicides or by mechanical removal.

Because of the wetness, a poor filtering capacity, and the depth to rock, the Ironrun and Arbutus soils are poorly suited to septic tank absorption fields. These limitations can result in the pollution of ground water. Mounding the site with suitable filtering material helps to overcome the limitations. Also, the effluent can be pumped to an absorption field on a better suited soil in nearby areas. Because of ponding and a poor filtering capacity, the Ponycreek soil generally is not suitable as a site for septic tank

absorption fields. Overcoming these limitations is difficult. A better suited site should be considered.

Because of the wetness, the Ironrun soil is poorly suited to dwellings. This limitation can be overcome by installing tile drains around foundations and providing gravity outlets or other dependable outlets and by constructing the foundations on coarse textured fill material above the level of wetness. Because of the ponding, the Ponycreek soil is generally not suitable as a site for dwellings. Overcoming the ponding is difficult. A better suited site should be considered. Because of the depth to bedrock, the Arbutus soil is only moderately suited to dwellings without basements and is poorly suited to dwellings with basements. This limitation can be overcome by ripping and excavating the bedrock with suitable power equipment, by adding fill material to raise the elevation of the site, or by constructing the dwellings with partially exposed basements.

Because of the wetness and the potential for frost action, the Ironrun soil is poorly suited to local roads and streets. Installing a subsurface drainage system and replacing the upper part of the soil with coarse textured base material, such as sand or gravel, helps to prevent the damage caused by wetness and by frost action. Because of the ponding, the Ponycreek soil generally is not suited to local roads and streets. Overcoming the ponding is difficult. A better suited site should be considered. Because of the depth to bedrock, the Arbutus soil is only moderately suited to local roads and streets. The bedrock can be removed by blasting or by using suitable power equipment.

The land capability classification is VIw. The woodland ordination symbol is 6W (Quaking aspen) for the Ironrun soil, 6W (Jack pine) for the Ponycreek soil, and 2S (Red maple) for the Arbutus soil. The forest habitat type commonly is PVRh for the Ironrun soil and PVGy for the Arbutus soil. No forest habitat type is assigned for the Ponycreek soil.

JaA—Jackson silt loam, 0 to 2 percent slopes

This very deep, nearly level, moderately well drained soil is on toe slopes. Individual areas are irregular in shape and generally range from 10 to 50 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 9 inches thick. The subsoil is friable silt loam about 46 inches thick. The upper part is dark brown, the next part is dark brown and mottled, and the lower part is pale brown and mottled. The substratum to a depth of about 60 inches is mostly very pale brown and reddish yellow fine sand. In places the slope is more than 2 percent.

Included with this soil in mapping are small areas of the well drained Bertrand and moderately well drained Toddville soils. Bertrand soils are in the slightly higher positions on the landscape. Toddville soils are in positions similar to those of the Jackson soil. They have a thicker and darker surface layer than the Jackson soil. Included soils make up 5 to 15 percent of the unit.

Permeability is moderate in the silty and loamy subsoil of the Jackson soil and rapid in the sandy substratum. The available water capacity is high. The content of organic matter is moderate in the surface layer. The surface layer is friable and can be easily tilled, but it tends to crust and puddle after hard rains or forms hard clods if tilled when too wet. An apparent seasonal high water table is at a depth of 3.5 to 6.0 feet.

Most areas are used as cropland. This soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Using a system of conservation tillage and returning crop residue to the soil or adding other organic material can help to maintain fertility and good tilth and increase the rate of water infiltration.

This soil is suited to pasture. The surface layer is subject to crusting, which restricts the emergence of plants. Overgrazing or grazing when the soil is too wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, pasture rotation, measures that improve fertility, and restricted use during wet periods help to keep the pasture in good condition.

This soil is suited to trees. Equipment use at log landings and on haul roads is restricted by low strength. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be strengthened with gravel or crushed rock. The log landings and haul roads can also be established in better suited included or adjacent areas. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal.

Because of the wetness, this soil is poorly suited to septic tank absorption fields. This limitation can be overcome by constructing a filtering mound of suitable material. Also, the effluent can be pumped to an absorption field on a better suited soil in nearby areas.

Because of the shrink-swell potential, this soil is only moderately suited to dwellings without basements. This limitation can be overcome by

excavating the soil and replacing it with coarse textured material, such as sand or gravel; by strengthening the foundation; and by installing a subsurface drainage system around the dwellings. Because of the wetness, the soil is only moderately suited to dwellings with basements. The wetness can be overcome by constructing the foundations on coarse textured fill material above the level of wetness or by installing tile drains around foundations and providing gravity outlets or other dependable outlets.

Because of the low strength and the potential for frost action, this soil is poorly suited to local roads and streets. These limitations can be overcome by replacing the upper part of the soil with a coarse textured base material, such as sand or gravel. Low strength can also be overcome by increasing the thickness of the pavement or base material.

The land capability classification is I. The woodland ordination symbol is 5A (Northern red oak). The forest habitat type commonly is ArCi.

JaB—Jackson silt loam, 2 to 6 percent slopes

This very deep, gently sloping, moderately well drained soil is on foot slopes and toe slopes. Individual areas are irregular in shape and generally range from 5 to 60 acres in size.

Typically, the surface layer is dark brown silt loam about 9 inches thick. The subsoil is friable silt loam about 41 inches thick. It is dark brown in the upper part and dark yellowish brown and mottled in the lower part. The substratum to a depth of about 60 inches is mostly brownish yellow and yellowish brown fine sand. In places the surface layer is darker and thicker. In some areas the slope is less than 2 percent or more than 6 percent.

Included with this soil in mapping are small areas of the well drained Bertrand and moderately well drained Toddville soils. Bertrand soils are in the slightly higher positions on the landscape. Toddville soils are in positions similar to those of the Jackson soil. They have a thicker and darker surface layer than the Jackson soil. Included soils make up 5 to 15 percent of the unit.

Permeability is moderate in the silty and loamy subsoil of the Jackson soil and rapid in the sandy substratum. The available water capacity is high. The content of organic matter is moderate in the surface layer. The surface layer is friable and can be easily tilled, but it tends to crust and puddle after hard rains or forms hard clods if tilled when too wet. An apparent seasonal high water table is at a depth of 3.5 to 6.0 feet.

Most areas are used as cropland. This soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, water erosion is a slight or moderate hazard. It can be controlled by terraces, grassed waterways, contour farming, contour stripcropping, and conservation tillage. Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth and increases the rate of water infiltration.

A cover of pasture plants is effective in controlling erosion. The surface layer is subject to crusting, which restricts the emergence of plants. Overgrazing or grazing when the soil is too wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, pasture rotation, measures that improve fertility, and restricted use during wet periods help to keep the pasture in good condition.

This soil is suited to trees. Equipment use at log landings and on haul roads is restricted by low soil strength. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be strengthened with gravel or crushed rock. The log landings and haul roads can also be established in better suited included or adjacent areas. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or mechanical removal.

Because of wetness, this soil is poorly suited to septic tank absorption fields. This limitation can be overcome by constructing a filtering mound of suitable material. Also, the effluent can be pumped to an absorption field on a better suited soil in nearby areas.

Because of the shrink-swell potential, this soil is only moderately suited to dwellings without basements. This limitation can be overcome by excavating the soil and replacing it with a coarse textured material, such as sand or gravel; by strengthening the foundation; and by installing a subsurface drainage system around the dwellings. Because of the wetness, the soil is only moderately suited to dwellings with basements. The wetness can be overcome by constructing the foundations on coarse textured fill material above the level of wetness or by installing tile drains around foundations and providing gravity outlets or other dependable outlets.

Because of the low strength and the potential for frost action, this soil is poorly suited to local roads and streets. These limitations can be overcome by

replacing the upper part of the soil with a coarse textured base material, such as sand or gravel. Low strength can also be overcome by increasing the thickness of the pavement or base material.

The land capability classification is IIe. The woodland ordination symbol is 5A (Northern red oak). The forest habitat type commonly is ArCi.

Ka—Kalmarville silt loam, 0 to 1 percent slopes

This very deep, nearly level, poorly drained soil is on flood plains along rivers and streams. It is subject to frequent flooding for brief periods. Individual areas are long and narrow and generally range from 10 to 100 acres in size.

Typically, the surface layer is very dark brown, mottled silt loam about 6 inches thick. The next layer is about 31 inches thick. It is dark gray, mottled very fine sandy loam that has strata of grayish brown and dark grayish brown silt loam and fine sandy loam. The upper part of the substratum is light brownish gray, mottled fine sandy loam about 5 inches thick. It has strata of grayish brown very fine sandy loam and silt loam. The lower part of the substratum to a depth of about 60 inches is light brownish gray sand. In places the surface layer is loam. In some areas part of the substratum is organic material.

Included with this soil in mapping are small areas of the very poorly drained Adder, somewhat poorly drained Coffton, and poorly drained Ettrick soils. Adder and Ettrick soils are in positions on the landscape similar to those of the Kalmarville soil. Adder soils formed in 16 to 51 inches of organic material. Ettrick soils are silty throughout. Coffton soils are in the slightly higher positions on the landscape. They are silty throughout. Included soils make up 10 to 15 percent of the unit.

Permeability is moderate or moderately rapid in the loamy alluvium in the Kalmarville soil and rapid in the sandy alluvium. The available water capacity is high. The content of organic matter is moderate in the surface layer. The rooting depth of most plants is limited by the apparent seasonal high water table, which is at or near the surface in undrained areas.

Most areas of this soil support brushy or grassy wetland vegetation. Some areas are wooded, and a few areas are used for pasture. Because of the wetness, a scarcity of drainage outlets, and the frequent flooding, this soil generally is not suited to cultivated crops. Also, it is poorly suited to pasture. A cover of pasture plants is effective in controlling scouring by floodwater. The quality of wetland or native forage plants generally is poor. Grazing is limited to short periods when the soil is dry.

Most areas of this soil are not forested or managed for trees. Because of the wetness and the flooding, trees grow slowly and are poorly shaped. Better suited sites should be considered if merchantable trees are to be grown.

This soil generally is not suitable as a site for septic tank absorption fields, dwellings, or local roads and streets, mainly because of the flooding and the wetness. Overcoming these limitations is difficult. A better suited site should be considered.

The land capability classification is Vw. No woodland ordination symbol or forest habitat type is assigned.

KeA—Kert silt loam, 0 to 3 percent slopes

This moderately deep, nearly level and gently sloping, somewhat poorly drained soil is on toe slopes. Individual areas are irregular in shape and generally range from 5 to 80 acres in size.

Typically, the surface layer is black silt loam about 2 inches thick. It is covered by about 1 inch of very dark grayish brown mucky peat, which is a mat of partially decomposed forest litter. The subsurface layer is brown silt loam about 5 inches thick. The subsoil is about 23 inches thick. It is mottled. The upper part is a mixture of dark yellowish brown and brown, friable silt loam, and the lower part is olive gray, firm silty clay loam. The substratum to a depth of about 60 inches is weakly cemented interbedded sandstone and shale. In places the surface layer is loam.

Included with this soil in mapping are small areas of the somewhat poorly drained Merrillan and poorly drained Veedum soils. Merrillan soils are in positions on the landscape similar to those of the Kert soil. They have more sand in the surface layer and subsoil than the Kert soil. Veedum soils are in the lower positions on the landscape. Included soils make up 5 to 10 percent of the unit.

Permeability is moderate in the upper part of the subsoil in the Kert soil. It is moderately slow or moderate in the lower part of the subsoil and extremely slow to moderately slow in the underlying interbedded sandstone and shale. The available water capacity is moderate. The content of organic matter is moderate or high in the surface layer. The surface layer is friable and can be easily tilled, but it tends to crust and puddle after hard rains and forms hard clods if tilled when too wet. A seasonal high water table is perched at a depth of 1.0 to 2.5 feet. The

rooting depth of most crops is limited by the seasonal high water table during wet periods of the growing season and by the interbedded sandstone and shale.

Areas of this soil are wooded or are used as cropland. Some areas are used as pasture. If drained, this soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, water erosion is a slight or moderate hazard. It can be controlled by contour farming, contour stripcropping, conservation tillage, and grassed waterways. Land smoothing, surface drains, diversions, and interceptor subsurface drains help to remove excess water. If tile drains are installed, the finer sand and the silt enter the tile lines unless suitable filters cover the tile. Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth, increases the rate of water infiltration, and helps to control water erosion and soil blowing.

This soil is suited to pasture. A cover of pasture plants is effective in controlling erosion. The surface layer is subject to crusting, which restricts the emergence of plants. Alfalfa is generally short lived because of the seasonal high water table and the winterkill caused by frost heave. Red clover is generally grown. Overgrazing or grazing when the soil is too wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, pasture rotation, measures that improve fertility, and restricted use during wet periods help to keep the pasture in good condition.

This soil is suited to trees. The equipment limitation and the windthrow hazard are management concerns. Equipment use is restricted by the wetness and by low soil strength. These restrictions can be reduced by using equipment during dry periods or during periods when the surface is frozen or has adequate snow cover. Equipment with flotation tires or with tracks has better traction than wheeled equipment. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be strengthened with gravel or crushed rock. The log landings and haul roads can also be established in better suited included or adjacent areas. Culverts and ditches can be used to maintain natural drainage systems along haul roads. Harvesting by clearcut or area-selection methods helps to prevent windthrow of the remaining trees. Natural seeding from unharvested trees promotes regeneration. Maintaining permanent all-season roads allows quick salvage of downed trees after periodic storms. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal.

Because of a thin layer over bedrock, the wetness, and the restricted permeability, this soil is poorly suited to septic tank absorption fields. Mounding the site with suitable filtering material helps to overcome these limitations. The effluent can also be pumped to an absorption field on a better suited soil in nearby areas.

Because of the wetness, this soil is poorly suited to dwellings. This limitation can be overcome by constructing foundations on coarse textured fill material above the level of wetness and by installing tile drains around the foundations and providing gravity outlets or other dependable outlets.

Because of the low strength and the potential for frost action, this soil is poorly suited to local roads and streets. These limitations can be overcome by installing a subsurface drainage system and replacing the upper part of the soil with coarse textured base material, such as sand or gravel. Low strength can also be overcome by increasing the thickness of the pavement or base material.

The land capability classification is IIw. The woodland ordination symbol is 4W (Northern red oak). The primary forest habitat type commonly is ArCi, and the secondary forest habitat type is PVHa.

LfC2—La Farge silt loam, 4 to 12 percent slopes, eroded

This moderately deep, gently sloping and sloping, well drained soil is on summits and shoulders of knolls, ridges, and hills. Individual areas are long and narrow or oblong and generally range from 5 to 30 acres in size.

In most cultivated areas, water erosion has removed much of the original surface layer. Typically, the remaining surface layer is dark grayish brown silt loam about 6 inches thick. It is mixed with some yellowish brown subsoil material. The subsoil is about 31 inches thick. It is yellowish brown and dark yellowish brown, friable silt loam in the upper part and olive brown, friable loam in the lower part. The substratum to a depth of about 60 inches is weakly cemented, fine grained glauconitic sandstone. In places the surface layer is thicker and darker. In some areas the sandstone is nonglauconitic and siliceous. In other areas the slope is less than 4 percent or more than 12 percent.

Included with this soil in mapping are small areas of the well drained Council, Seaton, and Urne soils. These soils are in landscape positions similar to

those of the La Farge soil. Council and Seaton soils are very deep. Council soils are loamy throughout, and Seaton soils are silty throughout. Urne soils have more sand in the surface layer and subsoil than the La Farge soil. Included soils make up 5 to 15 percent of the unit.

Permeability is moderate in the loess and loamy residuum in the La Farge soil and slow to moderate in the underlying sandstone. The available water capacity is moderate. The content of organic matter is moderately low or moderate in the surface layer. The surface layer is friable and can be easily tilled, but it tends to crust and puddle after hard rains or forms hard clods if it is tilled when too wet. The rooting depth of some crops is limited by the underlying sandstone.

Most areas are used as cropland. Some areas are wooded. This soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, water erosion is a moderate hazard. It can be controlled by contour farming, contour stripcropping, grassed waterways, and conservation tillage. Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth, increases the rate of water infiltration, and reduces the hazard of water erosion.

A cover of pasture plants is effective in controlling erosion. The surface layer is subject to crusting, which restricts the emergence of plants. Overgrazing or grazing when the soil is too wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, measures that improve fertility, and restricted use during wet periods help to keep the pasture in good condition.

This soil is suited to trees. Equipment use is restricted by the slope and low soil strength at log landings. Low strength also restricts the use of equipment on haul roads. Log landings can be established in nearly level or gently sloping included or adjacent areas. Low strength can be overcome by using equipment during dry periods or during periods when the surface layer is frozen or has adequate snow cover. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Log landings and haul roads can be strengthened with gravel or crushed rock. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal.

Because of seepage and a thin layer over bedrock, this soil is poorly suited to septic tank absorption fields. The poor filtering capacity can result in the pollution of ground water. Mounding the site with suitable filtering material helps to overcome these limitations. The effluent can also be pumped to an absorption field on a better suited soil in a nearby area.

Because of the shrink-swell potential and the slope, this soil is only moderately suited to dwellings. The shrink-swell potential can be overcome by excavating the soil around and below the foundation and replacing it with coarse textured material, such as sand or gravel; by increasing the strength of basement walls; and by installing a subsurface drainage system around the dwellings at or below the basement elevation. The slope can be overcome by cutting and filling, by installing retaining walls, or by designing the dwellings so that one side of the basement fronts on the lower part of the slope. Also, the dwellings can be constructed in the less sloping included areas.

Because of the low strength and the potential for frost action, this soil is poorly suited to local roads and streets. These limitations can be overcome by replacing the upper part of the soil with coarse textured base material, such as sand or gravel. Low strength also can be overcome by increasing the thickness of the pavement or base material.

The land capability classification is IIIe. The woodland ordination symbol is 4A (Northern red oak). The primary forest habitat type commonly is ArCi, and the secondary forest habitat type is ArDe-V.

LfD2—La Farge silt loam, 12 to 25 percent slopes, eroded

This moderately deep, moderately steep and steep, well drained soil is on shoulders, back slopes, nose slopes, and the upper foot slopes of knolls, ridges, and hills. Individual areas are long and narrow or oblong and generally range from 5 to 300 acres in size.

In most cultivated areas, erosion has removed much of the original surface layer. Typically, the remaining surface layer is dark brown silt loam about 8 inches thick. It is mixed with some yellowish brown subsoil material. The subsoil is about 31 inches thick. The upper part is dark brown and dark yellowish brown, friable silt loam. The next part is olive, friable loam. The lower part is pale olive and brownish yellow, friable loam. The substratum to a depth of about 60 inches is weakly cemented, fine grained glauconitic sandstone. In places the slope is less than 12 percent or more than 25 percent.

Included with this soil in mapping are small areas

of the well drained Council, Seaton, and Urne soils. These soils are in landscape positions similar to those of the La Farge soil. Council and Seaton soils are very deep. Council soils are loamy throughout, and Seaton soils are silty throughout. Urne soils have more sand in the surface layer and subsoil than the La Farge soil. Included soils make up 5 to 15 percent of the unit.

Permeability is moderate in the loess and loamy residuum in the La Farge soil and slow to moderate in the underlying sandstone. The available water capacity is moderate. The content of organic matter is moderately low or moderate in the surface layer. The surface layer is friable and can be easily tilled, but it tends to crust and puddle after hard rains or forms hard clods if it is tilled when too wet. The rooting depth of most crops is limited by the underlying sandstone.

Most areas are used as cropland or pasture. A few extensive areas are wooded. This soil is suited to corn and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, water erosion is a severe hazard. It can be controlled by contour farming, contour stripcropping, crop rotations that include grasses and legumes, and conservation tillage. Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth, increases the rate of water infiltration, and reduces the hazard of water erosion.

A cover of pasture plants is effective in controlling water erosion. The surface layer is subject to crusting, which restricts the emergence of plants. Overgrazing or grazing when the soil is too wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, measures that improve fertility, and restricted use during wet periods help to keep the pasture in good condition.

This soil is suited to trees. The erosion hazard and the equipment limitation are management concerns. Erosion is accelerated where runoff is concentrated on skid trails, log landings, and haul roads. Removing water with water bars, establishing out-sloping road surfaces, crowning the road surfaces, providing ditches and culverts, and establishing skid trails and haul roads on the contour minimize erosion. Erosion also can be controlled by seeding areas where logging has exposed the surface.

Equipment use is restricted by the slope and low soil strength. Skid trails and haul roads can be designed so that they conform to the topography and so that grades are kept as low as possible. Log landings can be established in the nearly level or gently sloping included or adjacent areas. The low strength can be overcome by using the equipment during dry periods or during periods when the surface is frozen or has an adequate snow cover. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be strengthened with gravel or crushed rock. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal.

Because of seepage, a thin layer over bedrock, and the slope, this soil generally is poorly suited to septic tank absorption fields. The poor filtering capacity can result in the pollution of ground water. The thin layer and seepage can be overcome by mounding the site with suitable filtering material. The slope can be overcome by cutting and filling or by installing a trench absorption system on the contour.

Because of the slope, this soil is poorly suited to dwellings. The slope can be overcome by cutting and filling or by installing retaining walls. Also, the dwellings can be designed so that one side of the basement fronts on the lower part of the slope, or the dwellings can be constructed in the less sloping included areas.

Because of the low strength, the slope, and the potential for frost action, this soil is poorly suited to local roads and streets. Low strength and frost action can be overcome by replacing the upper part of the soil with coarse textured base material, such as sand or gravel. Low strength also can be overcome by increasing the thickness of the pavement or base material. The slope can be overcome by shaping the roadway through cutting and filling. Also, the roads can be built in the less sloping areas.

The land capability classification is IVe. The woodland ordination symbol is 4R (Northern red oak). The primary forest habitat type commonly is ArCi, and the secondary forest habitat type is ArDe-V.

LsD2—La Farge-Seaton silt loams, 12 to 25 percent slopes, eroded

These soils are moderately deep and very deep, moderately steep and steep, and well drained. The La Farge soil is on back slopes and nose slopes of knolls, ridges, and hills. The Seaton soil is on the upper foot slopes and head slopes. The La Farge and Seaton soils occur as areas so intricately mixed or so small that it was not practical to map them separately. Individual areas are long and narrow or irregularly shaped and generally range from 10 to 80

acres in size. They are about 40 to 50 percent La Farge soil and 30 to 40 percent Seaton soil. In most cultivated areas much of the original surface layer of both soils has been lost through water erosion.

Typically, the surface layer of the La Farge soil is dark brown silt loam about 8 inches thick. It is mixed with some yellowish brown subsoil material. The subsoil is about 31 inches thick. The upper part is yellowish brown, friable silt loam. The next part is yellowish brown, friable loam. The lower part is light olive brown, friable fine sandy loam. The substratum to a depth of about 60 inches is weakly cemented fine grained glauconitic sandstone. In places the slope is less than 12 percent or more than 25 percent. In many areas the sandstone is nonglauconitic and siliceous.

Typically, the surface layer of the Seaton soil is dark brown silt loam about 8 inches thick. It is mixed with some dark yellowish brown subsoil material. The subsoil is dark yellowish brown, friable silt loam about 34 inches thick. The substratum to a depth of about 60 inches is yellowish brown silt loam.

Included with these soils in mapping are the well drained Council, moderately well drained Sebbo, and well drained Urne soils. Council soils are in positions on the landscape similar to those of the Seaton soil. They have more sand and less silt in the surface layer and subsoil than the Seaton soil. Urne soils are in positions similar to those of the La Farge soil. They have more sand and less silt and clay in the soil than the La Farge soil. The very deep Sebbo soils are in the lower positions on foot slopes. They have more sand than the Seaton and La Farge soils. Included soils make up 10 to 25 percent of the unit.

Permeability is moderate in the loess and loamy residuum in the La Farge soil and slow to moderate in the underlying sandstone. It is moderate in the Seaton soil. The available water capacity is moderate in the La Farge soil and very high in the Seaton soil. The content of organic matter is moderately low or moderate in the surface layer of both soils. The surface layer is friable and can be easily tilled, but it tends to crust and puddle after hard rains or forms hard clods if tilled when too wet. The rooting depth of most crops is limited by the underlying sandstone in the La Farge soil.

Most areas are used as cropland or pasture. These soils are suited to corn and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, water erosion is a severe hazard. It can be controlled by contour farming, contour stripcropping, crop rotations that include grasses and legumes, and conservation tillage. Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth, increases the rate of water infiltration, and reduces the hazard of erosion.

A cover of pasture plants is effective in controlling erosion. The surface layer is subject to crusting, which restricts the emergence of the plants. Overgrazing or grazing when the soils are too wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, pasture rotation, measures that improve fertility, and restricted use during wet periods help to keep the pasture in good condition.

These soils are suited to trees. The erosion hazard and equipment limitations are management concerns. Erosion is accelerated where runoff is concentrated on skid trails, log landings, and haul roads. Removing water with water bars, establishing out-sloping road surfaces, crowning the road surfaces, providing ditches and culverts, and establishing skid trails and haul roads on the contour minimize erosion. Erosion also can be controlled by seeding areas where logging has exposed the surface.

Equipment use is restricted by the slope and by low soil strength. Skid trails and haul roads can be designed so that they conform to the topography and so that grades are kept as low as possible. Log landings and haul roads can be established in the nearly level or gently sloping included or adjacent areas. Low strength can be overcome by using the equipment during dry periods or during periods when the surface is frozen or has adequate snow cover. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be strengthened with gravel or crushed rock. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal.

These soils are generally poorly suited to septic tank absorption fields because of a thin layer over bedrock, seepage, and the slope in areas of the La Farge soil and because of the slope in areas of the Seaton soil. The thin layer and seepage can be overcome by mounding the site with suitable filtering material. The slope can be overcome by installing a trench absorption system on the contour. Also, the less sloping included areas may be used.

Because of the slope, these soils are poorly suited to dwellings. This limitation can be overcome by cutting and filling, by installing retaining walls, or by designing the dwellings so that one side of the basement fronts on the lower part of the slope. Also,

the dwellings can be constructed in the less sloping included areas.

Because of the low strength, the slope, and the potential for frost action, these soils are poorly suited to local roads and streets. Low strength and frost action can be overcome by replacing the upper part of the soil with a coarse textured base material, such as sand or gravel. Low strength also can be overcome by increasing the thickness of the pavement or base material. The slope can be overcome by shaping the roadway through cutting and filling or by building the road in the less sloping areas.

The land capability classification is IVe. The woodland ordination symbol is 4R (Northern red oak) for the La Farge soil and 5R (Northern red oak) for the Seaton soil. The forest habitat type commonly is ArDe-V for the La Farge soil and ArCi for the Seaton soil.

Lt—Loxley peat, 0 to 1 percent slopes

This very deep, nearly level, very poorly drained soil is in depressions. It is subject to ponding. Individual areas are oblong or irregularly shaped and generally range from 10 to 1,500 acres in size.

Typically, the organic layers extend to a depth of more than 51 inches. The upper part is reddish brown peat about 4 inches thick, and the lower part is mostly black muck. In places the organic layers are less than 51 inches thick.

Included with this soil in mapping are small areas of the very poorly drained Dawsil and poorly drained Ponycreek soils. Dawsil soils are in positions on the landscape similar to those of the Loxley soil. They formed in 16 to 51 inches of organic material. Ponycreek soils are in the slightly higher positions. They are mostly sandy throughout. Included soils make up 2 to 10 percent of the unit.

Permeability is moderately slow to moderately rapid in the Loxley soil. The available water capacity is very high. The content of organic matter also is very high. The rooting depth of most plants is limited by the apparent seasonal high water table, which is near or above the surface in undrained areas.

Most areas support wetland vegetation. Because of the wetness, a scarcity of suitable drainage outlets, and the hazard of frost late in spring and early in fall, this soil is generally not suited to cultivated crops or to pasture. If drained and cultivated, the soil is subject to burning and subsidence. Also, it is subject to soil blowing. If intensive management is applied, some areas are suited to cranberries and other specialty crops.

Generally, this soil is poorly suited to trees. In most areas the trees grow slowly and are poorly shaped. Some areas, mainly areas that are naturally drained by stream entrenchment, support merchantable stands of conifers. The equipment limitation, seedling mortality, and the windthrow hazard are management concerns.

Equipment use is restricted by the wetness and by low soil strength. These restrictions can be reduced by using equipment when the surface is frozen or has adequate snow cover. Equipment with flotation tires or with tracks has better traction than wheeled equipment. Log landings and haul roads can be established in better suited included or adjacent areas. Seedling mortality caused by wetness can be reduced by careful machine planting on prepared ridges or by hand planting on cradle knolls and in the drier included areas. The selection of vigorous nursery stock is essential. Harvesting by clearcut or area-selection methods helps to prevent windthrow of the remaining trees. Natural seeding from unharvested trees promotes regeneration. Maintaining permanent all-season roads allows quick salvage of downed trees after periodic storms. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal.

This soil generally is not suitable as a site for septic tank absorption fields, dwellings, or local roads and streets, mainly because of the subsidence, the ponding, and the low strength. Overcoming these limitations is difficult. A better suited site should be considered.

The land capability classification is VIIw in undrained areas. The woodland ordination symbol is 2W (Black spruce). No forest habitat type is assigned.

LuB—Ludington sand, 1 to 6 percent slopes

This moderately deep, nearly level to gently sloping, moderately well drained soil is on summits and shoulders of knolls. Individual areas are irregular in shape and generally range from 4 to 100 acres in size.

Typically, the surface layer is very dark gray sand about 2 inches thick. It is covered by about 2 inches of very dark grayish brown mucky peat, which is a mat of partially decomposed forest litter. The subsurface layer is grayish brown sand about 2 inches thick. The subsoil is about 33 inches thick. The upper part is dark brown and brown, very friable

sand. The next part is yellowish brown, mottled, very friable sand. The lower part is pale olive, mottled, firm clay loam. The substratum to a depth of about 60 inches is weakly cemented interbedded sandstone and shale. In places the surface layer is fine sand or loamy sand.

Included with this soil in mapping are small areas of the somewhat poorly drained Fairchild and moderately well drained Humbird soils. Fairchild soils are in the lower positions on the landscape. Humbird soils are in positions similar to those of the Ludington soil. They have more clay in the solum than the Ludington soil. Included soils make up 5 to 15 percent of the unit.

Permeability is rapid in the sandy upper part of the subsoil in the Ludington soil. It is moderately slow or moderate in the loamy lower part of the subsoil and extremely slow to moderately slow in the underlying interbedded sandstone and shale. The available water capacity is low. The content of organic matter is moderately low or moderate in the surface layer. The surface layer is very friable and can be easily tilled throughout a wide range in moisture content. A seasonal high water table is perched at a depth of 1.5 to 3.5 feet. The rooting depth for most crops is limited by the seasonal high water table during wet periods of the growing season and by the underlying interbedded sandstone and shale.

Most areas are wooded. A few areas are used as cropland. This soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Crop yields in most years are limited by the low available water capacity. If irrigated, this soil is also suited to vegetables, such as snap beans, potatoes, sweet corn, and peas. If cultivated crops are grown, water erosion is a slight hazard. Also, the soil is subject to soil blowing. Wind stripcropping, field windbreaks, winter cover crops, and conservation tillage help to prevent excessive soil loss. Returning crop residue to the soil or adding other organic material reduces the effects of soil blowing, minimizes the amount of water lost through evaporation, increases the rate of water infiltration, helps to maintain fertility and good tilth, and reduces the hazard of erosion.

A cover of pasture plants is effective in controlling soil blowing and water erosion. Forage yields are generally low unless fertilizer is applied and adequate moisture is available. Planting early in spring, before the soil has a chance to dry, helps to overcome the droughtiness. Later plantings are likely to have a poor survival rate. Overgrazing can cause surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Measures that improve fertility, proper stocking rates, and pasture rotation help to keep the pasture in good condition.

This soil is suited to trees. The equipment limitation and seedling mortality are management concerns. Equipment use is restricted by the loose sand. This restriction can be reduced by using equipment when the surface is frozen. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Sandy areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be stabilized with gravel or crushed rock. The log landings and haul roads can also be established in better suited included or adjacent areas. Seedling mortality caused by droughtiness can be reduced by careful planting of containerized seedlings or vigorous nursery stock. It can also be reduced by planting when the soil is moist. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or mechanical removal.

Because of wetness, a thin layer over bedrock, and the restricted permeability, this soil is poorly suited to septic tank absorption fields. Mounding the site with suitable filtering material helps to overcome these limitations. Also, the effluent can be pumped to an absorption field on a better suited soil in nearby areas.

Because of the wetness, this soil is only moderately suited to dwellings without basements and is poorly suited to dwellings with basements. This limitation can be overcome by constructing the basement above the level of wetness, by raising the site with fill material, and by installing tile drains around the foundation and providing gravity outlets or other dependable outlets.

Because of the wetness, this soil is only moderately suited to local roads and streets. Installing a subsurface drainage system and replacing part of the soil with a coarse textured base material, such as sand or gravel, help to overcome the wetness.

The land capability classification is IVs. The woodland ordination symbol is 5A (Jack pine). The primary forest habitat type commonly is PVHa, and the secondary forest habitat type is PVCr.

LxB—Ludington-Fairchild sands, 0 to 6 percent slopes

These moderately deep soils are nearly level to gently sloping. The moderately well drained Ludington

soil is on the summits and shoulders of knolls. The somewhat poorly drained Fairchild soil is on toe slopes. The Ludington and Fairchild soils occur as areas so intricately mixed or so small that it was not practical to map them separately. Individual areas are irregular in shape and generally range from 10 to 80 acres in size. They are about 40 to 50 percent Ludington soil and 35 to 45 percent Fairchild soil.

Typically, the surface layer of the Ludington soil is very dark gray sand about 2 inches thick. It is covered by about 1 inch of partially decomposed leaf and grass litter. The subsurface layer is pinkish gray sand about 10 inches thick. The subsoil is about 26 inches thick. The upper part is dark brown, very friable sand. The next part is brownish yellow, mottled, very friable sand. The lower part is pale olive, mottled, firm loam. The substratum to a depth of about 60 inches is weakly cemented interbedded sandstone and shale. In places the surface layer is fine sand or loamy sand.

Typically, the surface layer of the Fairchild soil is black sand about 2 inches thick. It is covered by about 1 inch of partially decomposed leaf and grass litter. The subsurface layer is pinkish gray sand about 11 inches thick. The subsoil is about 22 inches thick. The upper part is dark reddish brown, very friable sand; the next part is dark brown, light yellowish brown, and pale brown, mottled, loose sand; and the lower part is light gray, mottled, firm loam. The substratum to a depth of about 60 inches is weakly cemented interbedded sandstone and shale. In places the surface layer is sandy loam, fine sand, or loamy sand.

Included with these soils in mapping are small areas of the moderately well drained Humbird and somewhat poorly drained Merrillan soils. Humbird soils are in positions on the landscape similar to those of the Ludington soil. They have more silt and clay in the upper part of the solum than the Ludington soil. Merrillan soils are in positions similar to those of the Fairchild soil. They have more silt and clay in the upper part of the subsoil than the Fairchild soils. Included soils make up 10 to 25 percent of the unit.

Permeability is rapid in the sandy upper part of the subsoil in the Ludington and Fairchild soils. It is moderately slow or moderate in the loamy lower part of the subsoil and extremely slow to moderately slow in the underlying interbedded sandstone and shale. The available water capacity is low in both soils. The content of organic matter is moderately low or moderate in the surface layer of the Ludington soil and moderate or high in the surface layer of the Fairchild soil. The seasonal high water table is perched at a depth of 1.5 to 3.5 feet in the Ludington soil and at a depth of 1.0 to 2.0 feet in the Fairchild soil. The rooting depth of most crops is limited by the seasonal high water table during wet periods of the growing season and by the interbedded sandstone and shale.

Most areas are wooded. The few areas that are used as cropland or pasture are reverting to woodland. These soils are suited to trees. The equipment limitation and seedling mortality in areas of both soils and the windthrow hazard in areas of the Fairchild soil are management concerns. Equipment use is restricted by loose sand. It is also restricted by the wetness and the low strength of the Fairchild soil. These restrictions can be reduced by using the equipment during dry periods or during periods when the surface is frozen or has adequate snow cover. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be strengthened with gravel or crushed rock. The log landings and haul roads can also be established in better suited included or adjacent areas. Culverts and ditches can be used to maintain natural drainage systems along haul roads. Harvesting by clearcut or area-selection methods helps to prevent windthrow of the remaining trees. Natural seeding from unharvested trees promotes regeneration. Maintaining permanent all-season roads allows quick salvage of downed trees after periodic storms. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal.

Because of a thin layer over bedrock, the wetness, and the restricted permeability, these soils are poorly suited to septic tank absorption fields. Mounding the site with suitable filtering material helps to overcome these limitations. Also, the effluent can be pumped to an absorption field on a better suited soil in nearby areas.

Because of the wetness, the Ludington soil is only moderately suited to dwellings without basements and is poorly suited to dwellings with basements. The Fairchild soil is poorly suited to all dwellings because of the wetness. This limitation can be overcome by constructing the foundation on coarse textured fill material above the level of wetness and by installing tile drains around the foundations and providing gravity outlets or other dependable outlets.

Because of the wetness, the Ludington soil is only moderately suited to local roads and streets and the Fairchild soil is poorly suited. Replacing the soil with coarse textured base material, such as sand or

gravel, and installing a subsurface drainage system help to overcome the wetness.

The land capability classification is IVs. The woodland ordination symbol is 5A (Jack pine) for the Ludington soil and 5W (Jack pine) for the Fairchild soil. The forest habitat type commonly is PVHa for the Ludington soil and PVRh for the Fairchild soil.

MaB—Mahtomedi loamy sand, 0 to 6 percent slopes

This very deep, nearly level and gently sloping, excessively drained soil is on flats and knolls. Individual areas are irregular in shape and generally range from 10 to 50 acres in size.

Typically, the surface layer is very dark brown loamy sand about 4 inches thick. The subsoil is about 22 inches thick. It is dark yellowish brown and dark brown, very friable sand in the upper part and strong brown, loose gravelly coarse sand in the lower part. The substratum to a depth of about 60 inches is light brown, stratified gravelly sand and very gravelly sand. In places the surface layer is sand. In some areas the slope is more than 6 percent.

Included with this soil in mapping are small areas of the well drained Dunnville and excessively drained Tarr soils. Dunnville soils are in the lower positions on the landscape. They have more silt and clay in the surface layer and subsoil than the Mahtomedi soil. Tarr soils are in positions similar to those of the Mahtomedi soil on the higher terraces. They have more sand and less gravel throughout than the Mahtomedi soil. Included soils make up 5 to 10 percent of the unit.

Permeability is rapid in the Mahtomedi soil. The available water capacity is low. The content of organic matter is low or moderately low in the surface layer. The surface layer is very friable and can be easily tilled throughout a wide range in moisture content. The rooting depth of most crops is limited by droughtiness.

Most areas are wooded. A few areas are used as cropland. This soil is poorly suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If irrigated, however, it is suited to the commonly grown farm crops and to vegetables, such as snap beans and sweet corn. In most years crop yields are limited by the low available water capacity. If cultivated crops are grown, water erosion is a slight hazard. Also, the soil is subject to soil blowing. Winter cover crops, conservation tillage, wind stripcropping, and field windbreaks help to prevent excessive soil loss. Returning crop residue to the soil or adding other organic material reduces the hazard of soil blowing and the amount of water lost through evaporation, increases the rate of water infiltration, and helps to maintain fertility and tilth.

A cover of pasture plants is effective in controlling soil blowing and water erosion. Forage yields are generally low unless fertilizer is applied and the supply of moisture is adequate. Planting early in spring, before the soil has a chance to dry, helps to overcome the droughtiness. Planting later in the year is likely to result in a poor survival rate. Overgrazing can cause surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Measures that improve fertility, proper stocking rates, and pasture rotation help to keep the pasture in good condition.

This soil is suited to pine trees. Hardwood trees grow slowly and are poorly shaped. The equipment limitation and seedling mortality are management concerns. Equipment with flotation tires or with tracks has better traction in loose sand than standard wheeled equipment. Sandy areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be stabilized by gravel or crushed rock. The log landings and haul roads can also be established in better suited included or adjacent areas. Seedling mortality caused by droughtiness can be reduced by careful planting of containerized seedlings or vigorous nursery stock. It can also be reduced by planting when the soil is moist.

This soil is suited to dwellings and to local roads and streets. The soil readily absorbs the effluent in septic tank absorption fields, but it does not adequately filter the effluent because of the rapid permeability. The poor filtering capacity can result in the pollution of ground water.

The land capability classification is IVs. The woodland ordination symbol is 8S (Red pine). The primary forest habitat type commonly is PVGy, and the secondary forest habitat type is PVCr.

MbA—Majik loamy fine sand, 0 to 3 percent slopes

This very deep, nearly level and gently sloping, somewhat poorly drained soil is in depressions and drainageways. Individual areas are irregular in shape and generally range from 4 to 100 acres in size.

Typically, the surface layer is very dark brown loamy fine sand about 4 inches thick. The subsurface layer is dark grayish brown loamy fine sand about 3 inches thick. The subsoil is about 22 inches thick. It is dark yellowish brown, very friable loamy fine sand in the upper part; yellowish brown, mottled, very friable fine sand in the next part; and reddish yellow,

mottled, loose fine sand in the lower part. The substratum to a depth of about 60 inches is white, mottled fine sand. In places the surface layer is loamy sand or fine sand. In some areas the subsoil or substratum has layers of reddish or brownish loamy sand.

Included with this soil in mapping are small areas of the moderately well drained Tint and poorly drained Newlang soils. Tint soils are in the slightly higher positions on the landscape. Newlang soils are in the lower positions. Included soils make up 10 to 15 percent of the unit.

Permeability is rapid in the Majik soil. The available water capacity is low. The content of organic matter is moderate or high in the surface layer. The surface layer is very friable and can be easily tilled throughout a wide range in moisture content. An apparent seasonal high water table is at a depth of 1.0 to 2.5 feet in undrained areas. The rooting depth of most crops is limited by the seasonal high water table during wet periods of the growing season.

Most areas are used as pasture or woodland. A few areas are used for cultivated crops. If drained, this soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Excess water can be removed by diversions, grassed waterways, surface drains, and drainage tile. If the water table is excessively lowered, however, crop yields in most years are limited by the low available water capacity. If irrigated, the soil is also suited to vegetables, such as snap beans, potatoes, and peas. If tile drains are installed, the fine sand enters the tile lines unless a suitable filter covers the tile. In areas that are drained and cultivated, the soil is subject to soil blowing. Soil blowing can be controlled by wind stripcropping, field windbreaks, and conservation tillage. Returning crop residue to the soil or adding other organic material reduces the hazard of soil blowing and the amount of water lost through evaporation, increases the rate of water infiltration, and helps to maintain fertility and tilth.

A cover of pasture plants is effective in controlling soil blowing. Forage yields are generally low unless fertilizer is applied and an adequate amount of moisture is supplied either through a controlled drainage system or through irrigation. Alfalfa is short lived unless the soil is drained. Red clover is generally grown. Overgrazing or grazing when the soil is too wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is suited to trees. Equipment use is restricted by the wetness. This limitation can be overcome by using the equipment during dry periods or during periods when the surface is frozen or has an adequate snow cover. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be strengthened with gravel or crushed rock. The log landings and haul roads can also be established in better suited adjacent areas.

Because of the wetness and a poor filtering capacity, this soil is poorly suited to septic tank absorption fields. These limitations can result in the pollution of ground water. Mounding the site with suitable filtering material helps to overcome the limitations. Also, the effluent can be pumped to an absorption field on a better suited soil in nearby areas.

Because of the wetness, this soil is poorly suited to dwellings. This limitation can be overcome by installing tile drains around foundations and providing gravity outlets or other dependable outlets and by constructing the foundations on coarse textured fill material above the level of wetness.

Because of the wetness and the potential for frost action, this soil is only moderately suited to local roads and streets. Installing a subsurface drainage system and replacing the upper part of the soil with coarse textured base material, such as sand or gravel, helps to prevent the damage caused by wetness and by frost action.

The land capability classification is IVw. The woodland ordination symbol is 5W (Jack pine). The forest habitat type commonly is PVRh.

MmA—Merimod silt loam, 0 to 3 percent slopes

This very deep, nearly level and gently sloping, moderately well drained soil is on toe slopes. Individual areas are irregular in shape and generally range from 5 to 50 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 9 inches thick. The subsoil is about 23 inches thick. The upper part is dark yellowish brown and dark brown, friable silt loam, and the lower part is dark brown loam and dark yellowish brown, friable sandy loam. The substratum extends to a depth of about 60 inches. It is yellowish brown sand

in the upper part and brownish yellow, mottled sand in the lower part. In places the surface layer is loam.

Included with this soil in mapping are small areas of the well drained Gardenvale and Merit soils and the somewhat poorly drained Sooner soils. Gardenvale and Merit soils are in the slightly higher positions on the landscape. Gardenvale soils are underlain by sandstone at a depth of 40 to 60 inches. Sooner soils are in the slightly lower positions. Included soils make up 5 to 15 percent of the unit.

Permeability is moderate in the silty and loamy mantle in the Merimod soil and rapid in the substratum. The available water capacity is moderate. The content of organic matter is moderate in the surface layer. The surface layer is friable and can be easily tilled throughout a wide range in moisture content. An apparent seasonal high water table is at a depth of 3.5 to 6.0 feet. The rooting depth of most crops is limited by the sandy substratum.

Most areas are used as cropland. Very few areas are wooded. This soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Using a system of conservation tillage and returning crop residue to the soil or adding other organic material can help to maintain fertility and good tilth and increase the rate of water infiltration.

This soil is suited to pasture. Overgrazing or grazing when the soil is too wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, pasture rotation, measures that improve fertility, and restricted use during wet periods help to keep the pasture in good condition.

This soil is suited to trees. Equipment use at log landings and on haul roads is restricted by low soil strength. This restriction can be reduced by using equipment during dry periods or during periods when the surface is frozen or has adequate snow cover. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be strengthened with gravel or crushed rock. The log landings and haul roads can also be established in better suited included or adjacent areas. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal.

This soil readily absorbs the effluent in septic tank absorption fields. It does not adequately filter the effluent, however, because of the rapid permeability in the substratum. The poor filtering capacity can result in the pollution of ground water. The wetness also is a limitation. Mounding the site with suitable filtering material helps to overcome the wetness and the poor filtering capacity. Also, the effluent can be pumped to an absorption field on a better suited soil in nearby areas.

This soil is only moderately suited to dwellings without basements because of the shrink-swell potential. It is only moderately suited to dwellings with basements because of the wetness. These limitations can be overcome by installing tile drains around foundations and providing gravity outlets or other dependable outlets and by constructing the foundations on coarse textured fill material above the level of wetness. Strengthening the foundation also helps to prevent the damage caused by shrinking and swelling.

Because of the shrink-swell potential and the potential for frost action, this soil is only moderately suited to local roads and streets. Replacing the upper part of the soil with coarse textured base material, such as sand or gravel, helps to prevent the damage caused by frost action and by shrinking and swelling.

The land capability classification is IIe. The woodland ordination symbol is 4A (Northern red oak). The forest habitat type commonly is ArDe-V.

MnB—Merit silt loam, 0 to 6 percent slopes

This very deep, nearly level and gently sloping, well drained soil is on toe slopes and knolls. Individual areas are irregular in shape and generally range from 4 to 60 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 9 inches thick. The subsoil is about 21 inches thick. The upper part is dark yellowish brown, friable silt loam. The lower part is dark brown, friable loam. The substratum to a depth of about 60 inches is strong brown sand. In places the surface layer is loam. In some areas the substratum has thin strata of loamy material. In other areas the slope is more than 6 percent.

Included with this soil in mapping are small areas of the well drained Bilson and Gardenvale soils and the moderately well drained Merimod soils. Bilson and Gardenvale soils are in positions on the landscape similar to those of the Merit soil. Bilson soils have more sand and less silt and clay in the surface layer and subsoil than the Merit soil. Gardenvale soils are underlain by sandstone at a depth of 40 to 60 inches. Merimod soils are in the slightly lower positions on the landscape. Included soils make up 10 to 15 percent of the unit.

Permeability is moderate in the silty and loamy

mantle in the Merit soil. It is rapid in the substratum. The available water capacity is moderate. The content of organic matter is moderate in the surface layer. The surface layer is friable and can be easily tilled throughout a wide range in moisture content. The rooting depth of most crops is limited by the sandy substratum.

Most areas are used as cropland. Very few areas are wooded. This soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, water erosion is a slight or moderate hazard. It can be controlled by grassed waterways, contour farming, contour stripcropping, and conservation tillage. Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth, increases the rate of water infiltration, and reduces the hazard of erosion.

A cover of pasture plants is effective in controlling erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, pasture rotation, measures that improve fertility, and restricted use during wet periods help to keep the pasture in good condition.

This soil is suited to trees. Equipment use at log landings and on haul roads is restricted by low soil strength. This restriction can be reduced by using equipment during dry periods or during periods when the surface is frozen or has adequate snow cover. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Areas subject to repeated use by heavy equipment, such as log landings or haul roads, can be strengthened with gravel or crushed rock. The log landings and haul roads can also be established in better suited included or adjacent areas. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal.

This soil readily absorbs the effluent in septic tank absorption fields. It does not adequately filter the effluent, however, because of the rapid permeability in the substratum. The poor filtering capacity can result in the pollution of ground water.

This soil is suited to dwellings with basements but is only moderately suited to dwellings without basements because of the shrink-swell potential. This limitation can be overcome by strengthening the foundation and by constructing the foundation on coarse textured fill material, such as sand or gravel.

This soil is only moderately suited to local roads and streets because of the potential for frost action and the shrink-swell potential. Replacing the upper part of the soil with coarse textured base material, such as sand or gravel, helps to prevent the damage caused by frost action and by shrinking and swelling.

The land capability classification is IIe. The woodland ordination symbol is 4A (Northern red oak). The forest habitat type commonly is ArDe-V.

MoB—Merit-Gardenvale silt loams, 1 to 6 percent slopes

These soils are deep and very deep, nearly level and gently sloping, and well drained. The Merit soil is on toe slopes and knolls. The Gardenvale soil is on summits and shoulders of knolls. The Merit and Gardenvale soils occur as areas so intricately mixed or so small that it was not practical to map them separately. Individual areas are irregular in shape and generally range from 20 to 200 acres in size. They are about 55 to 65 percent Merit soil and 20 to 30 percent Gardenvale soil.

Typically, the surface layer of the Merit soil is very dark grayish brown silt loam about 9 inches thick. The subsoil is about 21 inches thick. It is friable. The upper part is dark yellowish brown silt loam, and the lower part is dark brown loam. The substratum to a depth of about 60 inches is strong brown sand. In places the surface layer is loam. In some areas the loamy mantle is more than 40 inches thick. In other areas the substratum has thin strata of loamy material or has channery sand.

Typically, the surface layer of the Gardenvale soil is dark brown silt loam about 8 inches thick. The upper part of the subsoil is dark brown, friable silt loam about 18 inches thick. The lower part is brown, friable sandy loam about 4 inches thick. The substratum to a depth of about 60 inches is reddish yellow fine sand over weakly cemented sandstone. In places the surface layer is loam. In some areas the substratum contains thin strata of loamy material weathered from the sandstone.

Included with these soils in mapping are small areas of the well drained Bilson and Elevasil soils and the moderately well drained Merimod soils. Also included are some areas where the slope is more than 6 percent. Bilson soils are in positions on the landscape similar to those of the Merit soil. They have more sand and less silt and clay in the surface layer and subsoil than the Merit soil. Elevasil soils are slightly higher on the landscape than the Gardenvale soil. They are underlain by sandstone at a depth of less than 40 inches. Also, they have more sand and less silt and clay in the surface layer and

subsoil than the Gardenvale soil. Merimod soils are slightly lower on the landscape than the Merit soil. Included soils make up 10 to 25 percent of the unit.

Permeability is moderate in the silty and loamy mantle in the Merit soil and rapid in the substratum. It is moderate in the silty and loamy mantle in the Gardenvale soil, rapid in the sandy substratum, and moderately slow or moderate in the underlying sandstone. The available water capacity and the organic matter content in the surface layer are moderate in both soils. The surface layer is friable and can be easily tilled throughout a wide range in moisture content. The rooting depth of most crops is limited by the sandy substratum.

Most areas are used as cropland. Very few areas are wooded. These soils are suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, water erosion is a slight or moderate hazard. It can be controlled by grassed waterways, contour farming, contour stripcropping, and conservation tillage. Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth, increases the rate of water infiltration, and reduces the hazard of erosion.

A cover of pasture plants is effective in controlling water erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, pasture rotation, measures that improve fertility, and restricted use during wet periods help to keep the pasture in good condition.

These soils are suited to trees. Equipment use at log landings and on haul roads is restricted by low soil strength. This restriction can be reduced by using equipment during dry periods or during periods when the surface is frozen or has adequate snow cover. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be strengthened with gravel or crushed rock. The log landings and haul roads can also be established in better suited included or adjacent areas. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal.

These soils readily absorb the effluent in septic absorption fields. They do not adequately filter the effluent, however, because of the rapid permeability in the substratum. The poor filtering capacity can result in the pollution of ground water.

The Gardenvale soil is suited to dwellings. The Merit soil is suited to dwellings with basements but is only moderately suited to dwellings without basements because of the shrink-swell potential. This limitation can be overcome by strengthening the foundation and by constructing the foundation on coarse textured fill material, such as sand or gravel.

These soils are only moderately suited to local roads and streets because of the potential for frost action in both soils, the shrink-swell potential of the Merit soil, and the low strength of the Gardenvale soil. Replacing the upper part of the soil with coarse textured base material, such as sand or gravel, helps to overcome these limitations. Low strength can also be overcome by increasing the thickness of the pavement or base material.

The land capability classification is IIe. The woodland ordination symbol is 4A (Northern red oak). The forest habitat type commonly is ArDe-V.

MpA—Merrillan fine sandy loam, 0 to 3 percent slopes

This moderately deep, nearly level and gently sloping, somewhat poorly drained soil is on toe slopes. Individual areas are irregular in shape and generally range from 5 to 100 acres in size.

Typically, the surface layer is black fine sandy loam about 4 inches thick. It is covered by about 1 inch of very dark grayish brown mucky peat, which is a mat of partially decomposed forest litter. The subsurface layer is grayish brown fine sandy loam about 5 inches thick. The subsoil is about 24 inches thick. It is dark brown and brown, friable fine sandy loam in the upper part and olive gray, firm, mottled silty clay in the lower part. Weakly cemented interbedded sandstone and shale is at a depth of about 34 inches. In places the surface layer is loamy fine sand, sandy loam, or loam.

Included with this soil in mapping are small areas of the moderately well drained Humbird and poorly drained Veedum soils. Humbird soils are in the slightly higher positions on the landscape. Veedum soils are in the lower positions. Included soils make up 5 to 15 percent of the unit.

Permeability is moderate or moderately rapid in the loamy upper part of the subsoil in the Merrillan soil. It is slow in the clayey lower part of the subsoil and extremely slow to moderately slow in the underlying interbedded sandstone and shale. The available water capacity is low. The content of organic matter is moderate to high in the surface layer. The surface layer is friable and can be easily tilled throughout a wide range in moisture content. A

seasonal high water table is perched at a depth of 1 to 2 feet in undrained areas. The rooting depth of most crops is limited by the seasonal high water table during wet periods of the growing season and by the interbedded sandstone and shale.

Most areas are wooded. A few areas are used as cropland or pasture. This soil is suited to grasses and legumes for hay and pasture. If drained, it is suited to corn, soybeans, and small grain. If the water table is excessively lowered, however, crop yields are limited by the low available water capacity. Irrigation improves the suitability of this soil for most crops. If cultivated crops are grown, water erosion is a slight hazard. Also, the soil is subject to soil blowing. Winter cover crops, conservation tillage, wind stripcropping, and field windbreaks help to prevent excessive soil loss. Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth, increases the rate of water infiltration, and helps to control water erosion and soil blowing. Land smoothing, a surface drainage system, diversions, and interceptor subsurface drains help to remove excess water.

A cover of pasture plants is effective in controlling water erosion and soil blowing. Alfalfa is generally short lived because of the seasonal high water table and the winterkill caused by frost heave. Red clover is generally grown. Overgrazing or grazing when the soil is wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, measures that improve fertility, pasture rotation, and restricted use during wet periods help to keep the pasture in good condition.

This soil is suited to trees. The equipment limitation and the windthrow hazard are management concerns. Equipment use is restricted by the wetness and by low soil strength. These restrictions can be reduced by using the equipment during dry periods or during periods when the surface is frozen or has an adequate snow cover. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be strengthened with gravel or crushed rock. The log landings and haul roads can also be established in better suited included or adjacent areas. Harvesting by clearcut or area-selection methods helps to prevent windthrow of the remaining trees. Natural seeding from unharvested trees promotes regeneration. Maintaining permanent all-season roads allows quick salvage of downed trees after periodic storms. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or mechanical removal.

Because of a thin layer over bedrock, the wetness, and the restricted permeability, this soil is poorly suited to septic tank absorption fields. Mounding the site with suitable filtering material helps to overcome these limitations. Also, the effluent can be pumped to an absorption field on a better suited soil in nearby areas.

Because of the wetness, this soil is poorly suited to dwellings. This limitation can be overcome by constructing foundations on coarse textured fill material above the level of wetness and by installing tile drains around the foundations and providing gravity outlets or other dependable outlets.

Because of the wetness, the low strength, and the potential for frost action, this soil is poorly suited to local roads and streets. Low strength can be overcome by replacing the upper part of the soil with coarse textured base material, such as sand or gravel, and by increasing the thickness of the pavement or base material. Installing a subsurface drainage system and replacing the upper part of the soil with coarse textured base material help to prevent the damage caused by frost action and wetness.

The land capability classification is IIw. The woodland ordination symbol is 4W (Northern red oak). The primary forest habitat type commonly is PVHa, and the secondary forest habitat type is PVRh.

MrA—Merrillan-Veedum complex, 0 to 3 percent slopes

These moderately deep soils are nearly level and gently sloping. The somewhat poorly drained Merrillan soil is on toe slopes. The poorly drained Veedum soil is in drainageways and depressions. The Merrillan and Veedum soils occur as areas so intricately mixed or so small that it was not practical to map them separately. Individual areas are irregular in shape and generally range from 40 to 1,000 acres in size. They are about 40 to 50 percent Merrillan soil and 35 to 45 percent Veedum soil.

Typically, the surface layer of the Merrillan soil is very dark brown fine sandy loam about 3 inches thick. It is covered by about 1 inch of very dark grayish brown mucky peat, which is a mat of partially decomposed forest litter. The subsurface layer is grayish brown fine sandy loam about 2 inches thick. The subsoil is about 25 inches thick. The upper part

is dark brown, friable fine sandy loam. The next part is dark brown, mottled, friable fine sandy loam. The lower part is pale brown, mottled, firm silty clay loam and light brownish gray, mottled, firm clay loam. The substratum to a depth of about 60 inches is weakly cemented interbedded sandstone and shale. In some places the surface layer is loamy fine sand, sandy loam, or loam.

Typically, the surface layer of the Veedum soil is black muck about 3 inches thick. The subsurface layer is black silt loam about 6 inches thick. The subsoil is about 24 inches thick. It is dark grayish brown, mottled, friable silt loam in the upper part and grayish brown, mottled, firm clay loam in the lower part. The substratum to a depth of about 60 inches is weakly cemented interbedded sandstone and shale. In places the surface layer is mucky silt loam, silt loam, or loam.

Included with these soils in mapping are small areas of the very poorly drained Citypoint and somewhat poorly drained Fairchild soils. Citypoint soils are in positions on the landscape similar to those of the Veedum soil. They formed in 16 to 51 inches of organic material. Fairchild soils are in positions similar to those of the Merrillan soil. They are sandy in the upper part of the subsoil. Included soils make up 5 to 20 percent of the unit.

Permeability is moderate or moderately rapid in the upper loamy part of the subsoil in the Merrillan soil. It is slow in the clayey lower part of the subsoil and extremely slow to moderately slow in the underlying interbedded sandstone and shale. It is moderate in the silty upper part of the Veedum soil, moderately slow or moderate in the loamy residuum, and extremely slow to moderately slow in the interbedded sandstone and shale. The available water capacity is low in the Merrillan soil and moderate in the Veedum soil. The content of organic matter is moderate or high in the surface layer of the Merrillan soil and very high in the surface layer of the Veedum soil. The surface layer of both soils is very friable and can be easily tilled throughout a wide range in moisture content. A perched seasonal high water table is at a depth of 1 to 2 feet in the Merrillan soil and is above or near the surface in the Veedum soil. The rooting depth of most crops is limited by the seasonal high water table and the interbedded sandstone and shale.

Most areas of these soils are wooded or support wetland vegetation. Most areas of idle cropland or pasture are reverting to woodland.

The Merrillan soil is suited to trees. The Veedum soil is suited to some conifers but is poorly suited to most other trees. The equipment limitation and the windthrow hazard in areas of both soils and seedling mortality in areas of the Veedum soil are management concerns.

Equipment use is restricted by the wetness and by low soil strength. These restrictions can be reduced by using the equipment during dry periods or during periods when the surface is frozen or has adequate snow cover. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be strengthened with gravel or crushed rock. The log landings and haul roads can also be established in better suited included or adjacent areas. Culverts and ditches can be used to maintain natural drainage systems along haul roads. Seedling mortality caused by seasonal wetness in areas of the Veedum soil can be reduced by careful machine planting of vigorous nursery stock on prepared ridges or by hand planting on cradle knolls and in the drier included areas. Harvesting by clearcut or area-selection methods helps to prevent windthrow of the remaining trees. Natural seeding from unharvested trees promotes regeneration. Maintaining permanent all-season roads allows quick salvage of downed trees after periodic storms. Competing vegetation interferes with tree planting and natural regeneration after trees are harvested. It can be controlled by herbicides or by mechanical removal.

Because of the wetness, a thin layer over bedrock, and the restricted permeability, the Merrillan soil is poorly suited to septic tank absorption fields. Mounding the site with suitable filtering material helps to overcome these limitations. Also, the effluent can be pumped to an absorption field on a better suited soil in nearby areas. Because of ponding, the Veedum soil generally is not suited to septic tank absorption fields. Overcoming this limitation is difficult. A better suited site should be considered.

Because of the wetness, the Merrillan soil is poorly suited to dwellings. This limitation can be overcome by installing tile drains around foundations and providing gravity outlets or other dependable outlets and by constructing the foundations on coarse textured fill material above the level of wetness. Because of the ponding, the Veedum soil generally is not suitable as a site for dwellings. Overcoming this limitation is difficult. A better suited site should be considered.

Because of the wetness, the low strength, and the potential for frost action, the Merrillan soil is poorly suited to local roads and streets. Low strength can be overcome by replacing the upper part of the soil with coarse textured base material, such as sand or

gravel, and by increasing the thickness of the pavement or base material. Installing a subsurface drainage system and replacing part of the soil with a coarse textured base material help to prevent the damage caused by frost action and wetness. Because of the ponding, the low strength, and the potential for frost action, the Veedum soil generally is not suited to local roads and streets. Overcoming these limitations is difficult. A better suited site should be considered.

The land capability classification is VIw. The woodland ordination symbol is 4W (Northern red oak) for the Merrillan soil and 1W (Black ash) for the Veedum soil. The primary forest habitat type for the Merrillan soil commonly is PVHa, and the secondary forest habitat type is PVRh. No forest habitat type is assigned for the Veedum soil.

MxA—Moppet-Fordum complex, 0 to 3 percent slopes

These very deep, nearly level and gently sloping soils are on flood plains. The moderately well drained Moppet soil is occasionally flooded for very brief periods. The poorly drained Fordum soil is frequently flooded for long periods. The Moppet and Fordum soils occur as areas so intricately mixed or so small that it was not practical to map them separately. Individual areas are long and narrow and generally range from 10 to 200 acres in size. They are about 40 to 50 percent Moppet soil and 30 to 40 percent Fordum soil.

Typically, the surface layer of the Moppet soil is dark brown fine sandy loam about 4 inches thick. The subsoil is fine sandy loam about 28 inches thick. It is dark brown in the upper part and strong brown and mottled in the lower part. The substratum to a depth of about 60 inches is strong brown, mottled loamy fine sand and sand. In places the surface layer is sandy loam, loamy fine sand, or loamy sand.

Typically, the surface layer of the Fordum soil is black silt loam about 6 inches thick. The substratum extends to a depth of about 60 inches. The upper part is dark grayish brown and grayish brown, mottled fine sandy loam. The lower part is dark grayish brown sand that has common thin strata of dark gray fine sandy loam. In places the surface layer is mucky silt loam or loam.

Included with these soils in mapping are the very poorly drained Dawsil soils in the lower positions on the landscape. These included soils formed in 16 to 51 inches of organic material. They make up 10 to 20 percent of the unit.

Permeability is moderate or moderately rapid in the upper loamy part of the Moppet soil and rapid in the sandy lower part. It is moderate or moderately rapid in the upper loamy part of the Fordum soil and rapid or very rapid in the sandy lower part. The available water capacity is moderate in both soils. The content of organic matter is moderate in the surface layer of the Moppet soil and high or very high in the surface layer of the Fordum soil. An apparent seasonal high water table is at a depth of 2.5 to 3.5 feet in the Moppet soil and is above or near the surface in the Fordum soil. The rooting depth of most plants is limited by the seasonal high water table.

Most areas of these soils are wooded. The Moppet soil is suited to trees. The Fordum soil is poorly suited to most trees. The equipment limitation is a management concern on both soils. Seedling mortality and the windthrow hazard are additional concerns in areas of the Fordum soil.

Equipment use is restricted by the flooding and by the low strength of both soils. It is also restricted by the wetness of the Fordum soil. These restrictions can be reduced by using the equipment during dry periods when the surface is frozen or has adequate snow cover. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be stabilized by gravel or crushed rock. The log landings and haul roads can also be established in better suited included or adjacent areas. Culverts and ditches can be used to maintain natural drainage systems. Seedling mortality on the Fordum soil can be reduced by careful machine planting on prepared ridges or by hand planting on cradle knolls and in the drier included areas. Selecting vigorous nursery stock for planting also reduces the seedling mortality rate. Harvesting by clearcut or area-selection methods helps to prevent windthrow of the remaining trees on the Fordum soil. Natural seeding from unharvested trees promotes regeneration. Maintaining permanent all-season roads allows quick salvage of downed trees after periodic storms. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal.

These soils generally are not suitable as sites for septic tank absorption fields, dwellings, or local roads and streets, mainly because of the flooding. Overcoming this limitation is difficult. A better suited site should be considered.

The land capability classification is VIw. The woodland ordination symbol is 3L (Red maple) for the Moppet soil and 2W (Silver maple) for the Fordum soil. The primary forest habitat type for the Moppet

soil commonly is ArDe-V, and the secondary forest habitat type is PVCr. No forest habitat type is assigned for the Fordum soil.

Ne—Newlang muck, 0 to 2 percent slopes

This very deep, nearly level, poorly drained soil is on flood plains. It is subject to occasional flooding or ponding for brief periods. Individual areas are long and narrow or irregularly shaped and generally range from 5 to 300 acres in size.

Typically, the surface layer is black muck about 3 inches thick. The subsurface layer is black loamy sand about 3 inches thick. The subsoil is dark grayish brown, mottled, very friable sand about 16 inches thick. The substratum to a depth of about 60 inches is pale brown sand. In places the surface layer is mucky sand or loamy sand. In some areas the upper part of the subsoil is reddish brown. In other areas the substratum has thin strata of silt loam, loam, or sandy loam.

Included with this soil in mapping are small areas of the very poorly drained Adder and somewhat poorly drained Majik soils. Adder soils are in positions on the landscape similar to those of the Newlang soil. They formed in 16 to 51 inches of organic material. Majik soils are in the slightly higher positions. Included soils make up 5 to 10 percent of the unit.

Permeability is rapid in the Newlang soil. The available water capacity is low. The content of organic matter is very high in the surface layer. The rooting depth of most plants is limited by the apparent seasonal high water table, which is near or above the surface in undrained areas.

Most areas of this soil are wooded or support wetland vegetation. Some areas are used as pasture. Undrained areas are generally not suited to cultivated crops because of the wetness. Drained areas are suited to the commonly grown farm crops and to certain vegetables. If the water table is excessively lowered, however, crop yields usually are limited by the low available water capacity. Irrigation improves the suitability of this soil for most crops. The number of frost-free days per growing season is limited. Planting early maturing crop varieties or growing corn for silage helps to overcome the frost hazard. If drained and cultivated, the soil is subject to soil blowing.

This soil is poorly suited to pasture unless it is drained. Establishing an improved pasture is difficult because of the wetness. Grazing is limited to the short periods when the soil is dry. The native vegetation is generally of poor quality for forage.

This soil is poorly suited to most trees. It is better suited to conifers. The equipment limitation, seedling mortality, and the windthrow hazard are management concerns.

Equipment use is restricted by the wetness and the flooding. These restrictions can be reduced by using equipment during dry periods when the flooding hazard is less severe or during periods when the surface is frozen or has an adequate snow cover. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Culverts and ditches can be used to maintain natural drainage systems along haul roads. Seedling mortality caused by wetness can be reduced by careful machine planting on prepared ridges or by hand planting on cradle knolls and in the drier included areas. Selecting vigorous nursery stock for planting reduces the seedling mortality rate. Harvesting by clearcut or area-selection methods helps to prevent windthrow of the remaining trees. Natural seeding from unharvested trees promotes regeneration. Maintaining permanent all-season roads allows quick salvage of downed trees after periodic storms. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal.

This soil generally is not suitable as a site for septic tank absorption fields, dwellings, or local roads and streets, mainly because of the flooding and the ponding. Overcoming these limitations is difficult. A better suited site should be considered.

The land capability classification is Vlw in undrained areas. The woodland ordination symbol is 6W (Eastern white pine). No forest habitat type is assigned.

OrA—Orion silt loam, 0 to 3 percent slopes

This very deep, nearly level and gently sloping, somewhat poorly drained soil is on flood plains. It is subject to occasional flooding for brief periods. Individual areas are long and narrow and generally range from 4 to 100 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 8 inches thick. The upper part of the substratum, which is about 24 inches thick, is dark brown and dark grayish brown, mottled silt loam that has thin strata of light brownish gray very fine sand. The next 8 inches is a buried surface layer of black, mottled silt loam. The lower part of the substratum to a depth of about 60 inches is light brownish gray, mottled silt loam. In places the surface layer is fine

sandy loam. In some areas the lower part of the substratum contains thin strata of very fine sand.

Included with this soil in mapping are small areas of the moderately well drained Arenzville and poorly drained Ettrick soils. Arenzville soils are in the slightly higher positions on the landscape. Ettrick soils are in the lower positions. Included soils make up 10 to 20 percent of the unit.

Permeability is moderate in the Orion soil. The available water capacity is very high. The content of organic matter is moderately low or moderate in the surface layer. The surface layer is friable and can be easily tilled, but it tends to crust and puddle after hard rains or forms hard clods if it is tilled when too wet. An apparent seasonal high water table is at a depth of 1.0 to 2.5 feet in undrained areas. The rooting depth of most crops is limited by the seasonal high water table during wet periods of the growing season.

Most areas are used as cropland or pasture. Very few areas are wooded. If drained and protected from flooding, this soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Dikes and diversions help to prevent flooding. Land smoothing, diversions, and interceptor subsurface drains help to remove excess water. Restrictive soil layers may limit the movement of water into tile drains. If drainage tile is installed, silt and fine sand enter the tile lines unless a suitable filter is used to cover the tile. Applying a system of conservation tillage and returning crop residue to the soil or adding other organic material can help to maintain fertility and good tilth and increase the rate of water infiltration.

This soil is suited to pasture. The surface layer is subject to crusting, which restricts the emergence of plants. Alfalfa is generally short lived because of the seasonal high water table, the flooding, and winterkill caused by frost heave. Red clover is generally grown. Overgrazing or grazing when the soil is wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, measures that improve fertility, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

This soil is suited to trees. Equipment use is restricted by the wetness, the flooding, and low soil strength. These restrictions can be reduced by using equipment during dry periods when the flooding hazard is less severe or during periods when the surface is frozen or has an adequate snow cover. Log landings and haul roads can be established in better suited included or adjacent areas. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal.

This soil generally is not suitable as a site for septic tank absorption fields, dwellings, or local roads and streets, mainly because of the flooding and the wetness. Overcoming these limitations is difficult. A better suited site should be considered.

The land capability classification is IIw. The woodland ordination symbol is 2W (Silver maple). The forest habitat type commonly is ArCi.

Pa—Palms muck, 0 to 1 percent slopes

This very deep, nearly level, very poorly drained soil is on flood plains. It is subject to frequent flooding for long periods. Individual areas are long and narrow or irregularly shaped and generally range from 5 to 80 acres in size.

Typically, the upper part of the soil is about 40 inches of black muck. The substratum to a depth of about 60 inches is dark gray silt loam. In places the substratum is loam or sand.

Included with this soil in mapping are small areas of the poorly drained Kalmarville soils. These soils are in positions on the landscape similar to those of the Palms soil. They formed in silty and loamy alluvium. They make up 10 to 20 percent of the unit.

Permeability is moderately slow to moderately rapid in the organic layer in the Palms soil and moderately slow or moderate in the substratum. The available water capacity and the content of organic matter are very high. The rooting depth of most crops is limited by the apparent seasonal high water table, which is near or above the surface in undrained areas.

Most areas support wetland vegetation. Because of the wetness, the flooding, and the hazard of frost late in spring and early in fall, this soil is generally not suited to cultivated crops or pasture. If drained and protected from flooding, cultivated areas are subject to burning, subsidence, and soil blowing.

Generally, this soil is unsuited to trees. Existing trees grow slowly and are poorly shaped. Overcoming the limitations that affect management is difficult. A more suitable site should be selected.

This soil is not suitable as a site for septic tank absorption fields, dwellings, or local roads and streets because of the subsidence, the flooding, and the ponding. Overcoming these limitations is difficult. A better suited site should be considered.

The land capability classification is Vw in undrained areas. No woodland ordination symbol or forest habitat type is assigned.

Pt—Pits

This map unit consists of open excavations from which weakly cemented sandstone, loose sand, and, in a few places, gravel have been removed to a depth of at least several feet. Individual areas are irregular in shape and generally range from 4 to 80 acres in size.

Typically, the material on the bottom and sides of the pits is weakly cemented sandstone or sand. It is droughty. Other soil properties vary.

Included in mapping are piles of soil material that was removed from the area before the excavation was made. Also included are piles of excavated material. Included areas make up less than 5 percent of the unit.

Many pits are still actively mined. Some have been abandoned and are partially covered with brush and weeds. Other abandoned pits contain water.

The main management concern is reclamation of the pits after excavation. In most of the pits, land shaping and additions of suitable topsoil are needed before a plant cover can be established. The suitability of these pits for septic tank absorption fields, dwellings, and local roads and streets should be determined by onsite investigations.

The land capability classification is VIIIs. No woodland ordination symbol or forest habitat type is assigned.

Pu—Ponycreek muck, 0 to 2 percent slopes

This very deep, nearly level, poorly drained soil is in depressions. Individual areas are long and narrow or irregularly shaped and generally range from 5 to 100 acres in size.

Typically, the surface layer is dark reddish brown muck about 6 inches thick. The subsoil is light brownish gray, mottled, very friable sand about 25 inches thick. The substratum to a depth of about 66 inches is very pale brown sand. In places the surface layer is mucky sand or coarse sand. In some areas the substratum has thin strata of sandy loam.

Included with this soil in mapping are small areas of the very poorly drained Dawsil and somewhat poorly drained Ironrun soils. Dawsil soils are in positions on the landscape similar to those of the Ponycreek soil. They formed in 16 to 51 inches of organic material. Ironrun soils are in the slightly higher positions. Included soils make up 5 to 10 percent of the unit.

Permeability is rapid or very rapid in the Ponycreek soil. The available water capacity is low. The content of organic matter is very high in the surface layer. The rooting depth of most plants is limited by the apparent seasonal high water table, which is near or above the surface in undrained areas.

Most areas support wetland vegetation. A few areas are used for cranberries. Because of the wetness, a scarcity of suitable drainage outlets, and an extremely acid reaction, this soil is generally not suited to cultivated crops or pasture. If drained, cultivated areas are subject to soil blowing. If intensive management is applied, some areas are suited to cranberries and other specialty crops.

This soil is suited to trees, but most trees grow so poorly that they are barely merchantable. The soil is better suited to conifers. The equipment limitation, seedling mortality, and the windthrow hazard are management concerns.

Equipment use is restricted by low soil strength and the wetness. These restrictions can be reduced by using equipment during dry periods when the surface is frozen or has an adequate snow cover. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be strengthened with gravel or crushed rock. The log landings and haul roads can also be established in better suited included or adjacent areas. Culverts and ditches can be used to maintain natural drainage systems along haul roads. Seedling mortality caused by wetness can be reduced by careful machine planting on prepared ridges or by hand planting on cradle knolls and in the drier included areas. Selecting vigorous nursery stock for planting also reduces the seedling mortality rate. Harvesting by clearcut or area-selection methods helps to prevent windthrow of the remaining trees. Natural seeding from unharvested trees promotes regeneration. Maintaining permanent all-season roads allows quick salvage of downed trees after periodic storms. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal.

This soil generally is not suitable as a site for septic tank absorption fields, dwellings, or local

roads and streets, mainly because of the ponding. Overcoming the ponding is difficult. A better suited site should be considered.

The land capability classification is VIw in undrained areas. The woodland ordination symbol is 6W (Jack pine). No forest habitat type is assigned.

Pv—Ponycreek-Dawsil complex, 0 to 2 percent slopes

These very deep, nearly level soils are in depressions. The Ponycreek soil is poorly drained, and the Dawsil soil is very poorly drained. The two soils occur as areas so intricately mixed or so small that it was not practical to map them separately. Individual areas are irregular in shape and generally range from 40 to 800 acres in size. They are about 40 to 50 percent Ponycreek soil and 35 to 45 percent Dawsil soil.

Typically, the surface layer of the Ponycreek soil is dark reddish brown muck about 6 inches thick. The subsurface layer is black mucky sand about 2 inches thick. The subsoil is grayish brown, very friable sand about 13 inches thick. The substratum to a depth of about 66 inches is very pale brown sand. In places the surface layer is mucky sand or mucky coarse sand. In some areas the upper part of the subsoil is reddish brown.

Typically, the Dawsil soil has organic layers that are about 40 inches thick. The upper part is very dark grayish brown mucky peat, and the lower part is black muck. The substratum to a depth of about 60 inches is light brownish gray sand. In places the organic layers are more than 51 inches thick.

Included with these soils in mapping are the somewhat poorly drained Ironrun and poorly drained Elm Lake soils. Ironrun soils are in the slightly higher positions on the landscape. They are sandy throughout. Elm Lake soils are in landscape positions similar to those of the Ponycreek and Dawsil soils. They formed in siliceous sandy alluvium overlying loamy residuum derived from the underlying interbedded sandstone and shale. Included soils make up 5 to 15 percent of the unit.

Permeability is rapid or very rapid in the Ponycreek soil. It is moderately slow to moderately rapid in the organic part of the Dawsil soil and rapid in the substratum. The available water capacity is low in the Ponycreek soil and very high in the Dawsil soil. The content of organic matter is very high in the surface layer of both soils. The surface layer has low strength and can be tilled only when the moisture content is low. The rooting depth of most plants is limited by the apparent seasonal high water table, which is near or above the surface in undrained areas.

Most areas support wetland vegetation. A few areas are used for cranberries. Because of the wetness, a scarcity of suitable drainage outlets, and an extremely acid reaction, these soils are generally not suited to cultivated crops or pasture. If drained, cultivated areas are subject to burning, subsidence, and soil blowing. If intensive management is applied, some areas are suited to cranberries and other specialty crops.

The Ponycreek soil is poorly suited to trees. The Dawsil soil generally is not suited to most trees. It is somewhat suited to some conifers in areas where ponding is less frequent. A few areas support merchantable stands of conifers. The equipment limitation, seedling mortality, and the windthrow hazard are management concerns.

Equipment use is restricted by the wetness and by the low strength of these soils. These restrictions can be reduced by using equipment during dry periods or during periods when the surface is frozen or has adequate snow cover. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be established in better suited included or adjacent areas. The log landings and haul roads can also be strengthened with sand or gravel in some areas of the Ponycreek soil. Culverts and ditches can be used to maintain natural drainage along haul roads. Seedling mortality caused by wetness can be reduced by careful machine planting on prepared ridges or by hand planting on cradle knolls and in the drier included areas. Selecting vigorous nursery stock for planting also reduces the seedling mortality rate. Harvesting by clearcut or area-selection methods helps to prevent windthrow of the remaining trees. Natural seeding from unharvested trees promotes regeneration. Maintaining permanent all-season roads allows quick salvage of downed trees after periodic storms. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal.

These soils generally are not suitable as sites for septic tank absorption fields, dwellings, or local roads and streets, mainly because of the ponding. Overcoming this limitation is difficult. A better suited site should be considered.

The land capability classification in undrained areas is VIIw. The woodland ordination symbol is 6W (Jack pine) for the Ponycreek soil and 2W (Black

spruce) for the Dawsil soil. No forest habitat type is assigned.

Pw—Psammaquents, nearly level

These poorly drained soils are in depressions. They are drained by an intricate system of dikes and ditches but are frequently flooded on a controlled basis for long periods for the production of cranberries (fig. 11). Most areas are rectangular and range from about 10 to 250 acres in size.

Typically, Psammaquents are sandy and have a wide range in color and thickness of the individual layers. Generally, they consist of the lower part of sandy soils or the lower part of moderately deep organic soils from which the upper 20 to 40 inches has been removed to form the cranberry beds and the surrounding dikes. In places the surface layer is mucky sand.

Included with these soils in mapping are areas of dikes, ditches, small borrow pits, and reservoirs. These included areas make up 10 to 25 percent of the unit.

Permeability is rapid in the Psammaquents. The available water capacity is low. The content of organic matter in the surface layer ranges from moderately low to very high. Depth to the water table is manipulated throughout the year. The water table is near the surface for much of the growing season and is above the surface during some parts of the year.

Psammaquents are suited to cranberries but are not used for any other crop. Frost is a potential hazard in most months of the growing season. An intensive water management system, including controlled drainage and sprinkler irrigation, is needed.

Psammaquents are not suitable for septic tank absorption fields, dwellings, or local roads and streets because of the flooding and the wetness. If the surrounding dikes are removed, some areas are subject to ponding. Overcoming these limitations is difficult. A better suited site should be selected.

The land capability classification is VIw. No woodland ordination symbol or forest habitat type is assigned.

RkA—Rockdam sand, 0 to 3 percent slopes

This very deep, nearly level and gently sloping, moderately well drained soil is on toe slopes. Individual areas are irregular in shape and generally range from 10 to 200 acres in size.

Typically, the surface layer is very dark gray sand about 2 inches thick. It is covered by about 1 inch of very dark grayish brown mucky peat, which is a mat of partially decomposed forest litter. The subsurface layer is dark grayish brown sand about 3 inches thick. The subsoil is dark brown and yellowish brown, very friable sand about 21 inches thick. The upper part of the substratum is brownish yellow sand about 16 inches thick. The next part is yellow, mottled sand about 10 inches thick. The lower part of the substratum to a depth of about 61 inches is light gray, mottled sand. In places the surface layer is coarse sand, loamy sand, or loamy coarse sand.

Included with this soil in mapping are small areas of the somewhat poorly drained Ironrun and excessively drained Tarr soils. Ironrun soils are in the lower positions on the landscape. Tarr soils are in the higher positions. Included soils make up 5 to 15 percent of the unit.

Permeability is rapid or very rapid in the Rockdam soil. The available water capacity is low. The content of organic matter is moderately low or moderate in the surface layer. The surface layer is very friable and can be easily tilled throughout a wide range in moisture content. An apparent seasonal high water table is at a depth of 3.5 to 6.0 feet.

Most areas are wooded. A few areas are used as cropland or pasture. Some areas have been planted to pine. This soil is poorly suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. In most years crop yields are limited by the low available water capacity and by a short growing season.

A cover of pasture plants is effective in controlling soil blowing. Forage yields are generally low unless fertilizer is applied and the soil receives an adequate amount of moisture. Planting early in spring, before the soil has a chance to dry, helps to overcome the droughtiness. Later plantings are likely to have a poor survival rate. Overgrazing can cause surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Measures that improve fertility, proper stocking rates, and pasture rotation help to keep the pasture in good condition.

This soil is suited to pine trees. Hardwood trees grow slowly and are poorly shaped. The equipment limitation and seedling mortality are management concerns. Equipment use is restricted by the loose sand. This restriction can be reduced by using equipment when the surface is frozen. Equipment with flotation tires or with tracks has better traction in loose sand than standard wheeled equipment. Sandy areas subject to repeated use by heavy equipment,

Figure 11.—Harvesting cranberries in an area of Psammaquents, nearly level.

such as log landings and haul roads, can be stabilized by gravel or crushed rock. The log landings and haul roads can also be established in better suited included or adjacent areas. Seedling mortality caused by droughtiness can be reduced by careful planting of vigorous nursery stock or containerized seedlings and by planting when the soil is moist.

This soil readily absorbs the effluent in septic tank absorption fields. It does not adequately filter the effluent, however, because of the rapid or very rapid permeability in the substratum. The poor filtering capacity can result in the pollution of ground water. Wetness also is a limitation. Mounding the site with suitable filtering material helps to overcome the wetness and the poor filtering capacity. Also, the effluent can be pumped to an absorption field on a better suited soil in nearby areas.

This soil is suited to local roads and streets and to dwellings without basements. Because of the wetness, however, it is only moderately suited to dwellings with basements. This limitation can be overcome by installing tile drains around foundations and providing gravity outlets or other dependable outlets and by constructing the foundations on coarse textured fill material above the level of wetness.

The land capability classification is IVs. The woodland ordination symbol is 6S (Jack pine). The primary forest habitat type commonly is PVGy, and the secondary forest habitat type is PVCr.

RoA—Rowley silt loam, 0 to 3 percent slopes

This very deep, nearly level and gently sloping, somewhat poorly drained soil is on toe slopes and in

slight depressions. Individual areas are oblong or irregularly shaped and generally range from 10 to 40 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 11 inches thick. The subsoil is about 39 inches thick. The upper part is dark grayish brown, mottled, friable silt loam. The next part is grayish brown, mottled, friable silt loam. The lower part is light brownish gray, mottled silt loam that has strata of yellowish brown sand. The substratum to a depth of about 60 inches is yellowish brown sand. In places the surface layer is thinner or lighter colored. In some areas the slope is more than 3 percent.

Included with this soil in mapping are small areas of the poorly drained Ettrick and moderately well drained Toddville and Jackson soils. Ettrick soils are in the lower positions on the landscape. They are subject to flooding. Jackson and Toddville soils are in the slightly higher positions. Jackson soils have a thinner and lighter colored surface layer than the Rowley soil. Included soils make up 5 to 15 percent of the unit.

Permeability is moderate in the subsoil of the Rowley soil and rapid in the substratum. The available water capacity is very high. The content of organic matter is moderate or high in the surface layer. The surface layer is friable and can be easily tilled, but it tends to crust and puddle after hard rains or forms hard clods if tilled when too wet. An apparent seasonal high water table is at a depth of 1 to 2 feet in undrained areas. The rooting depth of most crops is limited by the seasonal high water table during wet periods of the growing season.

Most areas are used as cropland, and a few areas are used as pasture. This soil is not naturally forested and generally is not managed for trees. If drained, the soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Land smoothing, diversions, and interception subsurface drains help to remove excess water. Restrictive soil layers may limit the movement of water into tile drains. If tile drainage is installed, silt and fine sand enter the tile lines unless a suitable filter is used to cover the tile. Applying a system of conservation tillage and returning crop residue or other organic material to the soil help to maintain fertility and good tilth and increase the rate of water infiltration.

This soil is suited to pasture. The surface layer is subject to crusting, which restricts the emergence of plants. Alfalfa is generally short lived because of the seasonal high water table, flooding, and winterkill from frost heave. Red clover is generally grown. Overgrazing or grazing when the soil is wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable species. Proper stocking rates, measures that improve fertility, pasture rotation, and restricted use during wet periods help to keep the pasture in good condition.

Because of the wetness, this soil is poorly suited to septic tank absorption fields. This limitation can be overcome by mounding the site with suitable filtering material. Also, the effluent can be pumped to an absorption field on a better suited soil in some nearby areas.

Because of the wetness, this soil is poorly suited to dwellings. This limitation can be overcome by installing tile drains around the foundations and providing gravity outlets or other dependable outlets and by constructing foundations on coarse textured fill material above the level of wetness.

Because of low soil strength and the potential for frost action, this soil is poorly suited to local roads and streets. Low strength can be overcome by replacing the upper part of the soil with a coarse textured base material, such as sand or gravel, and by increasing the thickness of the pavement or base material. Installing a subsurface drainage system and replacing the upper part of the soil with a coarse textured base material help to prevent the damage caused by frost action.

The land capability classification is IIw. The woodland ordination symbol is 2A (Silver maple). No forest habitat type is assigned.

SeB—Seaton silt loam, 2 to 6 percent slopes

This very deep, gently sloping, well drained soil is on summits and shoulders. Individual areas are oblong or long and narrow and generally range from 5 to 30 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 9 inches thick. The subsoil is friable silt loam about 39 inches thick. It is dark brown in the upper part and dark yellowish brown in the lower part. The substratum to a depth of about 60 inches is yellowish brown, mottled silt loam. The mottles in the substratum are relict and are not associated with a seasonal high water table. In places the surface layer is darker. In some areas the substratum is sandy. In other areas the slope is more than 6 percent.

Included with this soil in mapping are small areas of the well drained Council and La Farge soils. These soils are in positions on the landscape similar to those of the Seaton soil. Council soils have more

sand and less clay in the surface layer and subsoil than the Seaton soil. La Farge soils are underlain by sandstone. Included soils make up 5 to 15 percent of the unit.

Permeability is moderate in the Seaton soil. The available water capacity is very high. The content of organic matter is moderately low or moderate in the surface layer. The surface layer is friable and can be easily tilled, but it tends to crust and puddle after hard rains or forms hard clods if it is tilled when too wet.

Most areas are used as cropland. This soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, water erosion is a slight or moderate hazard. It can be controlled by terraces, grassed waterways, contour farming, contour stripcropping, and conservation tillage. Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth, increases the rate of water infiltration, and reduces the hazard of erosion.

A cover of pasture plants is effective in controlling water erosion. The surface layer is subject to crusting, which restricts the emergence of plants. Overgrazing or grazing when the soil is too wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, pasture rotation, measures that improve fertility, and restricted use during wet periods help to keep the pasture in good condition.

This soil is suited to trees. Equipment use at log landings and on haul roads is restricted by low soil strength. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be strengthened with gravel or crushed rock. The log landings and haul roads can also be established in better suited included or adjacent areas. Low strength can also be overcome by using equipment during dry periods or during periods when the surface is frozen or has adequate snow cover. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal.

This soil is suited to septic tank absorption fields and to dwellings. It is poorly suited to local roads and streets because of low strength and the potential for frost action. These limitations can be overcome by replacing the upper part of the soil with coarse textured base material, such as sand or gravel. Low strength also can be overcome by increasing the thickness of the pavement or base material.

The land capability classification is IIe. The woodland ordination symbol is 5A (Northern red oak). The forest habitat type commonly is ArCi.

SeC2—Seaton silt loam, 6 to 12 percent slopes, eroded

This very deep, sloping, well drained soil is on shoulders and back slopes. Individual areas are long and narrow or irregularly shaped and generally range from 4 to 60 acres in size.

In most cultivated areas, erosion has removed much of the original surface layer. Typically, the remaining surface layer is dark brown silt loam about 9 inches thick. It is mixed with some brown subsoil material. The subsoil is friable silt loam about 37 inches thick. It is brown in the upper part and dark yellowish brown and mottled in the lower part. The substratum to a depth of about 60 inches is pale brown, mottled silt loam. The mottles in the lower part of the subsoil and in the substratum are relict and are not associated with a seasonal high water table. In places the surface layer is thicker and darker. In some areas the substratum is sandy. In other areas the slope is less than 6 percent or more than 12 percent.

Included with this soil in mapping are small areas of the well drained Council and La Farge soils and the moderately well drained Sebbo soils. Council soils are in positions on the landscape similar to those of the Seaton soil. They have more sand and less clay in the surface layer and subsoil than the Seaton soil. La Farge soils are in the higher positions. They are underlain by sandstone. Sebbo soils are on foot slopes. They have more sand in the surface layer and subsoil than the Seaton soil. Included soils make up 5 to 15 percent of the unit.

Permeability is moderate in the Seaton soil. The available water capacity is very high. The content of organic matter is moderately low or moderate in the surface layer. The surface layer is friable and can be easily tilled, but it tends to crust and puddle after hard rains or forms hard clods if it is tilled when too wet.

Most areas are used as cropland. A few areas are used as pasture or are wooded. This soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, water erosion is a moderate hazard. It can be controlled by terraces, contour farming, contour

stripcropping, grassed waterways, and conservation tillage. Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth, increases the rate of water infiltration, and reduces the hazard of erosion.

A cover of pasture plants is effective in controlling water erosion. The surface layer is subject to crusting, which restricts the emergence of plants. Overgrazing or grazing when the soil is too wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, pasture rotation, measures that improve fertility, and restricted use during wet periods help to keep the pasture in good condition.

This soil is suited to trees. Equipment use is restricted by the slope and by low soil strength at log landings. It is restricted by low strength on haul roads. Log landings can be established in nearly level or gently sloping included or adjacent areas. Low strength can be overcome by using equipment during dry periods or during periods when the surface is frozen or has adequate snow cover. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be strengthened with gravel or crushed rock. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal.

Because of the slope, this soil is only moderately suited to septic tank absorption fields. This limitation can be overcome by installing a trench absorption system on the contour. Also, the absorption field can be installed in included areas where the slope is less than 6 percent.

Because of the slope, this soil is only moderately suited to dwellings. This limitation can be overcome by cutting and filling, by installing retaining walls, or by designing the dwellings so that one side of the basement fronts on the lower part of the slope. Also, the dwellings can be constructed in the less sloping included areas.

Because of the low strength and the potential for frost action, this soil is poorly suited to local roads and streets. These limitations can be overcome by replacing the upper part of the soil with coarse textured base material, such as sand or gravel. Low strength also can be overcome by increasing the thickness of the pavement or base material.

The land capability classification is IIIe. The woodland ordination symbol is 5A (Northern red oak). The forest habitat type commonly is ArCi.

SmB—Sebbo loam, 1 to 6 percent slopes

This very deep, nearly level and gently sloping, moderately well drained soil is on toe slopes. Individual areas are irregular in shape and generally range from 4 to 80 acres in size.

Typically, the surface layer is very dark grayish brown loam about 9 inches thick. The subsoil is about 35 inches thick. It is dark brown, friable loam in the upper part; yellowish brown, mottled, friable loam in the next part; and light yellowish brown, mottled, friable silt loam in the lower part. The substratum to a depth of about 60 inches is yellowish brown, mottled silt loam. In places the surface layer is silt loam or sandy loam. In some areas the slope is more than 6 percent. In other areas the substratum has strata of sand or sandy loam.

Included with this soil in mapping are small areas of the well drained Council and Seaton soils in the higher positions on the landscape. Council soils have more sand in the surface layer and subsoil than the Sebbo soil, and Seaton soils have less sand in the surface layer and subsoil. Included soils make up 5 to 15 percent of the unit.

Permeability is moderate in the Sebbo soil. The available water capacity is very high. The content of organic matter is moderate or high in the surface layer. The surface layer is friable and can be easily tilled, but it tends to crust and puddle after hard rains or forms clods if it is tilled when too wet. A perched seasonal high water table is at a depth of 3.5 to 6.0 feet.

Most areas are used as cropland. This soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. If cultivated crops are grown, water erosion is a slight or moderate hazard. It can be controlled by terraces, contour farming, contour stripcropping, grassed waterways, and conservation tillage. Applying a system of conservation tillage and returning crop residue to the soil or adding other organic material can help to maintain fertility and good tilth and increase the rate of water infiltration.

This soil is suited to pasture. The surface layer is subject to crusting, which restricts the emergence of plants. Overgrazing or grazing when the soil is too wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, measures that improve fertility, and restricted use during wet periods help to keep the pasture in good condition.

This soil is suited to trees. Equipment use at log landings and on haul roads is restricted by low soil

strength. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be strengthened with gravel or crushed rock. The log landings and haul roads can also be established in better suited included or adjacent areas. Low strength can be overcome by using equipment during dry periods or during periods when the surface is frozen or has adequate snow cover. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal.

Because of the wetness, this soil is poorly suited to septic tank absorption fields. This limitation can be overcome by mounding the site with suitable filtering material. Also, the effluent can be pumped to an absorption field on a better suited soil in nearby areas.

This soil is suited to dwellings without basements, but it is only moderately suited to dwellings with basements because of the wetness. This limitation can be overcome by installing tile drains around the foundations and providing gravity outlets or other dependable outlets and by constructing the foundations on coarse textured fill material above the level of wetness.

This soil is poorly suited to local roads and streets because of the low strength and the potential for frost action. These limitations can be overcome by replacing the upper part of the soil with coarse textured base material, such as sand or gravel. Low strength also can be overcome by increasing the thickness of the pavement or base material.

The land capability classification is IIe. The woodland ordination symbol is 4A (Northern red oak). The forest habitat type commonly is ArCi.

SnA—Sechler loam, 0 to 3 percent slopes

This very deep, nearly level and gently sloping, somewhat poorly drained soil is on flood plains. It is subject to occasional flooding for brief periods. Individual areas are oblong and generally range from 10 to 50 acres in size.

Typically, the surface layer is black loam about 9 inches thick. The subsurface layer also is black loam. It is about 3 inches thick. The subsoil is about 15 inches thick. The loamy part contains gravel-sized iron nodules. The upper part is dark reddish brown, friable very gravelly loam. The next part is reddish brown, mottled, friable very gravelly fine sandy loam. The lower part is pinkish gray, mottled, very friable loamy fine sand. The substratum to a depth of about 60 inches is mostly very pale brown, mottled, loose fine sand. In places the surface layer is gravelly loam or silt loam. In some areas the surface layer is thinner or lighter colored. In other areas the subsoil is not gravelly.

Included with this soil in mapping are small areas of the moderately well drained Whitehall and poorly drained Kalmarville soils. Whitehall soils are in the slightly higher positions on the landscape. They have more silt and clay and less sand in the surface layer and subsoil than the Sechler soil. Kalmarville soils are in the lower positions on flood plains. Included soils make up 10 to 15 percent of the unit.

Permeability is moderate in the loamy part of the subsoil in the Sechler soil. It is moderately rapid in the sandy part of the subsoil and rapid in the substratum. The available water capacity is moderate. The content of organic matter is moderate or high in the surface layer. The surface layer is friable and can be easily tilled throughout a wide range in moisture content. An apparent seasonal high water table is at a depth of 1 to 2 feet in undrained areas. The rooting depth of most plants is limited by the seasonal high water table during wet periods of the growing season or by the sandy substratum.

Most areas are used as cropland. Some areas are used as pasture or woodland. This soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Dikes and diversions help to prevent flooding. Land smoothing, diversions, and interception drains help to remove excess water. Applying a system of conservation tillage and returning crop residue or other organic material to the soil help to maintain fertility and good tilth, increase the rate of water infiltration, and reduce the hazard of water erosion and scouring during flooding.

This soil is suited to pasture. The surface layer is subject to crusting, which restricts the emergence of plants. Alfalfa is generally short lived unless the soil is adequately drained. Red clover is generally grown. Overgrazing or grazing when the soil is too wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Pasture rotation, proper stocking rates, measures that improve fertility, and restricted use during wet periods help to keep the pasture in good condition.

This soil is not naturally forested and is not generally managed for woodland. There are some forested areas, mainly along the Black River, where competing grass vegetation has not totally interfered with the natural growth of trees.

This soil generally is not suitable as a site for

septic tank absorption fields, dwellings, or local roads and streets, mainly because of the flooding and the wetness. Overcoming these limitations is difficult. A better suited site should be selected.

The land capability classification is IIw. No woodland ordination symbol or forest habitat type is assigned.

SoA—Sooner silt loam, 0 to 3 percent slopes

This very deep, nearly level and gently sloping, somewhat poorly drained soil is on toe slopes and in slight depressions. Individual areas are irregular in shape and generally range from 5 to 80 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 9 inches thick. The subsoil is about 22 inches thick. It is friable. The upper part is dark yellowish brown, mottled silt loam. The next part is dark yellowish brown and yellowish brown, mottled loam. The lower part is yellowish brown, mottled sandy loam. The substratum to a depth of about 60 inches is yellowish brown, mottled sand. In places the surface layer is sandy loam or loam.

Included with this soil in mapping are small areas of the moderately well drained Bilmod and Merimod soils and the somewhat poorly drained Hoop soils. Bilmod and Merimod soils are in the slightly higher positions on the landscape. Bilmod soils have more sand and less silt and clay in the surface layer and subsoil than the Sooner soil. Hoop soils are in landscape positions similar to those of the Sooner soil. They have less silt and clay and more sand in the surface layer and subsoil than the Sooner soil. Included soils make up 5 to 15 percent of the unit.

Permeability is moderate in the silty and loamy alluvium in the Sooner soil and rapid or very rapid in the sandy alluvium. The available water capacity is moderate. The content of organic matter is moderate or high in the surface layer. The surface layer is friable and can be easily tilled throughout a wide range in moisture content. An apparent seasonal high water table is at a depth of 1 to 2 feet in undrained areas. The rooting depth for most crops is limited by the seasonal high water table during wet periods of the growing season or by the sandy substratum.

Most areas are used as cropland. Very few areas are wooded. A few areas are used as pasture. If drained, this soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Excess water can be removed by diversions, grassed waterways, surface drains, and interceptor subsurface drains. If tile drains are installed, the finer sand enters the tile lines unless a suitable filter covers the tile. Applying a system of conservation tillage and returning crop residue to the soil or adding other organic material can help to maintain fertility and good tilth and increase the rate of water infiltration.

This soil is suited to pasture. Alfalfa is short lived unless the soil is adequately drained. Red clover is generally grown. Overgrazing or grazing when the soil is too wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, measures that improve fertility, and restricted use during wet periods help to keep the pasture in good condition.

This soil is suited to trees. Equipment use is restricted by the wetness and by low soil strength on log landings and haul roads. These limitations can be overcome by using the equipment during dry periods or during periods when the surface is frozen or has adequate snow cover. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be strengthened with gravel or crushed rock. The log landings and haul roads can also be established in better suited included or adjacent areas. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal.

Because of the wetness and a poor filtering capacity, this soil is poorly suited to septic tank absorption fields. These limitations can result in the pollution of ground water. Mounding the site with suitable filtering material helps to overcome the limitations. Also, the effluent can be pumped to an absorption field on a better suited soil in nearby areas.

Because of the wetness, this soil is poorly suited to dwellings. This limitation can be overcome by installing tile drains around foundations and providing gravity outlets or other dependable outlets and by constructing the foundations on coarse textured fill material above the level of wetness.

Because of the potential for frost action, this soil is poorly suited to local roads and streets. Installing a subsurface drainage system and replacing the upper part of the soil with coarse textured base material, such as sand or gravel, helps to prevent the damage caused by frost action.

The land capability classification is IIw. The woodland ordination symbol is 2A (Silver maple). The forest habitat type commonly is ArDe-V.

SpA—Sparta sand, 0 to 3 percent slopes

This very deep, nearly level and gently sloping, excessively drained soil is on low stream terraces. Individual areas are irregular in shape and generally range from 5 to 80 acres in size.

Typically, the surface layer and the subsurface layer are very dark brown and dark brown sand about 16 inches thick. The subsoil is about 26 inches thick. It is dark brown, very friable sand in the upper part and dark yellowish brown, loose sand in the lower part. The substratum to a depth of about 60 inches is light yellowish brown sand. In places the surface layer is loamy sand or fine sand. In some areas the surface layer is thinner and lighter colored. In other areas the substratum contains thin strata of loamy fine sand or fine sandy loam.

Included with this soil in mapping are small areas of the well drained Dunnville soils and small areas that have a seasonal high water table at a depth of 3.5 to 6.0 feet. Dunnville soils are in the higher positions on the landscape. They formed in loamy deposits. Included soils make up 5 to 10 percent of the unit.

Permeability is rapid in the Sparta soil. The available water capacity is low. The content of organic matter is moderately low in the surface layer. The surface layer is very friable and can be easily tilled throughout a wide range in moisture content.

Most areas are used as cropland. A few areas are wooded. This soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. In most years crop yields are limited by the low available water capacity. If irrigated, this soil is suited to the commonly grown farm crops and to vegetables, such as sweet corn and peas. If cultivated crops are grown, the soil is subject to soil blowing. Winter cover crops, conservation tillage, wind stripcropping, and field windbreaks help to prevent excessive soil loss. Returning crop residue to the soil or adding other organic material reduces the hazard of soil blowing and the amount of water lost through evaporation, increases the rate of water infiltration, and helps to maintain fertility and good tilth.

A cover of pasture plants is effective in controlling soil blowing. Forage yields are generally low unless fertilizer is applied and the supply of moisture is adequate. Planting early in the spring, before the soil has a chance to dry, helps to overcome the droughtiness. Later plantings are likely to have a poor survival rate. Overgrazing can cause surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Measures that improve fertility, proper stocking rates, and pasture rotation help to keep the pasture in good condition.

This soil is suited to pine trees. Hardwoods grow slowly and are poorly shaped. The equipment limitation and seedling mortality are management concerns. Equipment use is restricted by the loose sand. This restriction can be reduced by using equipment only when the surface is frozen. Equipment with flotation tires or with tracks has better traction in loose sand than standard wheeled equipment. Sandy areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be stabilized with gravel or crushed rock. Seedling mortality caused by droughtiness can be reduced by careful planting of vigorous nursery stock or containerized seedlings and by planting when the soil is moist.

This soil is suited to dwellings and to local roads and streets. It readily absorbs the effluent in septic tank absorption fields. It does not adequately filter the effluent, however, because of the rapid permeability. The poor filtering capacity can result in the pollution of ground water.

The land capability classification is IVs. The woodland ordination symbol is 6S (Jack pine). The primary forest habitat type commonly is PVGy, and the secondary forest habitat type commonly is PVCr.

TrB—Tarr sand, 0 to 6 percent slopes

This very deep, nearly level and gently sloping, excessively drained soil is on foot slopes and toe slopes. Individual areas are irregular in shape and generally range from 4 to 300 acres in size.

Typically, the surface layer is very dark grayish brown sand about 8 inches thick. The subsoil is dark brown and strong brown, loose sand about 28 inches thick. The substratum to a depth of about 60 inches is yellow sand. In places the surface layer is loamy sand or fine sand. In some areas the surface layer is thinner or thicker. In other areas the substratum has loamy sand and reddish strata. In some places the slope is more than 6 percent.

Included with this soil in mapping are small areas of the well drained Bilson soils, the excessively drained Boone and Impact soils, and the moderately well drained Tint soils. Bilson and Impact soils are in positions on the landscape similar to those of the Tarr soil. Bilson soils have more silt and clay in the surface layer and subsoil than the Tarr soil, and Impact soils have a thicker, darker surface layer. Boone soils are in the slightly higher positions on the

landscape. They are underlain by sandstone. Tint soils are in the lower positions. They have a mottled substratum. Included soils make up 5 to 15 percent of the unit.

Permeability is rapid in the Tarr soil. The available water capacity is low. The content of organic matter is low or moderately low in the surface layer. The surface layer is very friable and can be easily tilled throughout a wide range in moisture content.

Most areas are wooded. Some areas are used as cropland or have been planted to pine trees. This soil is poorly suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. In most years crop yields are limited by the low available water capacity. If irrigated, however, the soil is suited to the commonly grown farm crops and to vegetables, such as snap beans and sweet corn. If cultivated crops are grown, water erosion is a slight hazard. Also, the soil is subject to soil blowing. Winter cover crops, conservation tillage, wind stripcropping, and field windbreaks help to prevent excessive soil loss. Returning crop residue to the soil or adding other organic material reduces the hazard of soil blowing and the amount of water lost through evaporation, increases the rate of water infiltration, and helps to maintain fertility and tilth.

A cover of pasture plants is effective in controlling soil blowing and water erosion. Forage yields are generally low unless fertilizer is applied and the supply of moisture is adequate. Planting early in spring, before the soil has a chance to dry, helps to overcome the droughtiness. Later plantings are likely to have a poor survival rate. Overgrazing can cause surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Measures that improve fertility, proper stocking rates, and pasture rotation help to keep the pasture in good condition.

This soil is suited to pine trees. Hardwood trees grow slowly and are poorly shaped. The equipment limitation and seedling mortality are management concerns. Equipment use is restricted by the loose sand. This restriction can be reduced by using equipment only when the surface is frozen. Equipment with flotation tires or with tracks has better traction in loose sand than standard wheeled equipment. Sandy areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be stabilized with gravel or crushed rock. Seedling mortality caused by droughtiness can be reduced by careful planting of vigorous nursery stock or containerized seedlings and by planting when the soil is moist.

This soil is suited to dwellings and to local roads and streets. The soil readily absorbs the effluent in septic tank absorption fields, but it does not adequately filter the effluent because of the rapid permeability. The poor filtering capacity can result in the pollution of ground water.

The land capability classification is IVs. The woodland ordination symbol is 6S (Red pine). The primary forest habitat type commonly is PVGy, and the secondary forest habitat type is PVCr.

TrC—Tarr sand, 6 to 15 percent slopes

This very deep, sloping and moderately steep, excessively drained soil is on foot slopes, back slopes, and head slopes. Individual areas are irregular in shape and generally range from 4 to 100 acres in size.

Typically, the surface layer is very dark grayish brown sand about 2 inches thick. It is covered by about 1 inch of partially decomposed leaf and grass litter. The subsoil is very friable sand about 28 inches thick. It is dark yellowish brown in the upper part and strong brown in the lower part. The substratum to a depth of about 60 inches is yellow sand. In places the surface layer is loamy sand or fine sand or is thicker. In some areas the substratum has strata of loamy sand or reddish sand. In other areas the slope is less than 6 percent or more than 15 percent.

Included with this soil in mapping are small areas of the excessively drained Boone, somewhat excessively drained Gosil, and moderately well drained Tint soils. Boone soils are in the higher positions on the landscape. They are underlain by sandstone. Gosil soils are in positions similar to those of the Tarr soil. They have slightly more clay and silt in the subsoil than the Tarr soil. Tint soils are in the lower, less sloping positions. They have a mottled substratum. Included soils make up 5 to 15 percent of the unit.

Permeability is rapid in the Tarr soil. The available water capacity is low. The content of organic matter is low or moderately low in the surface layer. The surface layer is very friable and can be easily tilled throughout a wide range in moisture content.

Most areas are wooded. Some areas are used as cropland or have been planted to pine. This soil is poorly suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. In most years crop yields are limited by the low available water capacity. The soil is not suited to irrigation because of the slope. If cultivated crops are grown, erosion is a slight hazard. Also, the soil is subject to soil blowing. Winter cover crops, contour

stripcropping, conservation tillage, wind stripcropping, and field windbreaks help to prevent excessive soil loss. Returning crop residue to the soil or adding other organic material reduces the amount of water lost through evaporation, increases the rate of water infiltration, helps to maintain fertility and good tilth, and helps to control water erosion and soil blowing.

A cover of pasture plants is effective in controlling soil blowing and water erosion. Forage yields are generally low unless fertilizer is applied and the supply of moisture is adequate. Planting early in spring, before the soil has a chance to dry, helps to overcome the droughtiness. Later plantings are likely to have a poor survival rate. Overgrazing can cause surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Measures that improve fertility, proper stocking rates, and pasture rotation help to keep the pasture in good condition.

This soil is suited to pine trees. Hardwood trees grow slowly and are poorly shaped. The equipment limitation and seedling mortality are management concerns. Equipment use is restricted by the loose sand and by the slope at log landings. Equipment with flotation tires or with tracks has better traction in loose sand than standard wheeled equipment. Sandy areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be stabilized with gravel or crushed rock. Log landings can also be established in nearly level or gently sloping included or adjacent areas. Seedling mortality caused by droughtiness can be reduced by careful planting of vigorous nursery stock or containerized seedlings and by planting when the soil is moist.

This soil readily absorbs the effluent in septic tank absorption fields. It does not adequately filter the effluent, however, because of the rapid permeability. The poor filtering capacity can result in the pollution of ground water.

Because of the slope, this soil is only moderately suited to dwellings. This limitation can be overcome by cutting and filling, installing retaining walls, or designing the dwellings so that one side of the basement fronts on the lower part of the slope. Also, the dwellings can be constructed in the less sloping included areas.

Because of the slope, this soil is only moderately suited to local roads and streets. This limitation can be overcome by cutting and filling or by building the road in the less sloping areas.

The land capability classification is VIs. The woodland ordination symbol is 6S (Red pine). The primary forest habitat type commonly is PVGy, and the secondary forest habitat type is PVCr.

TrF—Tarr sand, 15 to 45 percent slopes

This very deep, moderately steep to very steep, excessively drained soil is on the upper foot slopes, on back slopes, and on head slopes. Individual areas are long and narrow and generally range from 10 to 100 acres in size.

Typically, the surface layer is black sand about 2 inches thick. It is covered by about 2 inches of partially decomposed leaf and grass litter. The subsurface layer is brown sand about 6 inches thick. The subsoil is yellowish brown, loose sand about 22 inches thick. The substratum to a depth of about 60 inches is brownish yellow sand. In places the surface layer is loamy sand or fine sand. In some areas the substratum has layers of reddish sand or loamy sand. In other areas the slope is less than 15 percent.

Included with this soil in mapping are small areas of the excessively drained Boone soils. These soils are in the higher positions on the landscape. They are underlain by sandstone. They make up 10 to 15 percent of the unit.

Permeability is rapid in the Tarr soil. The available water capacity is low. The content of organic matter is low or moderately low in the surface layer.

Most areas are wooded. A few areas are used as pasture. Because of droughtiness, water erosion, and soil blowing, this soil is generally not suited to cultivated crops and pasture. Using machinery is difficult in the sloping areas. In some of the less sloping areas, the pasture can be renovated and improved. The native vegetation generally is of poor quality for forage.

This soil is suited to pine trees. Hardwood trees grow slowly and are poorly shaped. The erosion hazard, the equipment limitation, and seedling mortality are management concerns. Erosion is accelerated where runoff is concentrated on skid trails, log landings, and haul roads. Removing water with water bars, establishing out-sloping road surfaces, crowning the road surfaces, providing culverts and ditches, and establishing skid trails and haul roads on the contour help to control erosion. Erosion also can be controlled by seeding areas where logging has exposed the surface.

Equipment use is restricted by the slope. Skid trails and haul roads can be designed so that they conform to the topography and so that grades are

kept as low as possible. In very steep areas, it may be necessary to yard the logs by cable. Log landings can be established in nearly level or gently sloping included or adjacent areas. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Seedling mortality caused by droughtiness can be reduced by careful planting of vigorous nursery stock or containerized seedlings. It can also be reduced by planting mostly on north- or east-facing slopes and by planting when the soil is moist.

This soil generally is not suited to use as a site for septic tank absorption fields or for dwellings or local roads and streets, mainly because of the slope. Overcoming this limitation is difficult. It may be possible to use the small, less sloping included areas for these uses, but in general a better suited site should be considered.

The land capability classification is VIIs. The woodland ordination symbol is 6R (Red pine). The primary forest habitat type commonly is PVGy, and the secondary forest habitat type is PVCr.

TtA—Tint sand, 0 to 3 percent slopes

This very deep, nearly level and gently sloping, moderately well drained soil is in slight depressions. Individual areas are irregular in shape and generally range from 5 to 80 acres in size.

Typically, the surface layer is very dark grayish brown sand about 9 inches thick. The subsoil is sand about 25 inches thick. It is dark yellowish brown and very friable in the upper part and yellowish brown and loose in the lower part. The substratum to a depth of about 60 inches is very pale brown and brownish yellow, mottled sand. In places the surface layer is loamy sand or fine sand. In some areas the surface layer is thicker and darker. In other areas the substratum has loamy strata or reddish sand. In some places the slope is more than 3 percent.

Included with this soil in mapping are small areas of the somewhat poorly drained Majik, excessively drained Tarr, and moderately well drained Tintson soils. Majik soils are in the lower positions on the landscape. Tarr and Tintson soils are in the higher positions. Tintson soils have more silt and clay in the substratum than the Tint soil. Included soils make up 5 to 15 percent of the unit.

Permeability is rapid in the Tint soil. The available water capacity is low. The content of organic matter is low or moderately low in the surface layer. The surface layer is very friable and can be easily tilled throughout a wide range in moisture content. An apparent seasonal high water table is at a depth of 3.5 to 6.0 feet.

Most areas are used as cropland. A few areas are wooded. Some areas have been planted to pine. This soil is poorly suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. In most years crop yields are limited by the low available water capacity. If irrigated, however, the soil is suited to the commonly grown farm crops and to vegetables, such as sweet corn and peas. If cultivated crops are grown, the soil is subject to soil blowing. Winter cover crops, contour stripcropping, conservation tillage, wind stripcropping, and field windbreaks help to prevent excessive soil loss. Returning crop residue to the soil or adding other organic material reduces the hazard of soil blowing and the amount of water lost through evaporation, increases the rate of water infiltration, and helps to maintain fertility and good tilth.

A cover of pasture plants is effective in controlling soil blowing. Forage yields are generally low unless fertilizer is applied and the soil receives an adequate amount of moisture. Planting early in spring, before the soil has a chance to dry, helps to overcome the droughtiness. Later plantings are likely to have a poor survival rate. Overgrazing can cause surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Measures that improve fertility, proper stocking rates, and pasture rotation help to keep the pasture in good condition.

This soil is suited to pine trees. Hardwood trees grow slowly and are poorly shaped. The equipment limitation and seedling mortality are management concerns. Equipment use is restricted by the loose sand. This restriction can be reduced by using the equipment only when the surface is frozen. Equipment with flotation tires or with tracks has better traction in loose sand than standard wheeled equipment. Sandy areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be stabilized with gravel or crushed rock. Seedling mortality caused by droughtiness can be reduced by careful planting of vigorous nursery stock or by using containerized seedlings. It can also be reduced by planting when the soil is moist.

This soil readily absorbs the effluent in septic tank absorption fields. It does not adequately filter the effluent, however, because of the rapid permeability. The poor filtering capacity can result in the pollution of ground water. The wetness also is a limitation. Mounding the site with suitable filtering material helps to overcome the wetness and the poor filtering capacity. Also, the effluent can be pumped to an

absorption field on a better suited soil in nearby areas.

This soil is suited to local roads and streets and to dwellings without basements. Because of the wetness, however, it is only moderately suited to dwellings with basements. This limitation can be overcome by installing tile drains around foundations and providing gravity outlets or other dependable outlets and by constructing the foundations on coarse textured fill material above the level of wetness.

The land capability classification is IVs. The woodland ordination symbol is 6S (Red pine). The primary forest habitat type commonly is PVGy, and the secondary forest habitat type is PVCr.

TuB—Tintson sand, 0 to 6 percent slopes

This very deep, nearly level and gently sloping, moderately well drained soil is on broad knolls, toe slopes, and foot slopes. Individual areas are irregular in shape and generally range from 8 to 100 acres in size.

Typically, the surface layer is dark brown sand about 8 inches thick. The subsoil is dark yellowish brown and yellowish brown, very friable and loose sand about 20 inches thick. The upper part of the substratum is mottled yellow sand about 18 inches thick. The lower part to a depth of about 60 inches is mottled yellowish brown loam. In places the surface layer is loamy sand or fine sand. In some areas the surface layer is thicker and darker. In other areas the slope is more than 6 percent.

Included with this soil in mapping are small areas of the moderately well drained Bilmod and Tint soils, the somewhat poorly drained Majik soils, and the excessively drained Tarr soils. Bilmod and Tint soils are in positions on the landscape similar to those of the Tintson soil. Bilmod soils have more silt and clay in the surface layer and subsoil than the Tintson soil, and Tint soils have more sand in the substratum. Majik soils are in the lower positions on the landscape, and Tarr soils are in the higher positions. Tarr soils have more sand in the substratum than the Tintson soil. Included soils make up 5 to 15 percent of the unit.

Permeability is rapid in the sandy mantle in the Tintson soil and moderate in the loamy substratum. The available water capacity is moderate. The content of organic matter is low or moderately low in the surface layer. The surface layer is very friable and can be easily tilled throughout a wide range in moisture content. The seasonal high water table is perched at a depth of 2.5 to 3.5 feet. The rooting depth of most crops is limited by the seasonal high water table during wet periods of the growing season.

Most areas are used as cropland. A few areas are wooded. Some areas have been planted to pine. This soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. In most years crop yields are limited by the low available water capacity. If irrigated, however, the soil is suited to the commonly grown farm crops and to vegetables, such as sweet corn and peas. If cultivated crops are grown, water erosion is a slight hazard. Also, the soil is subject to soil blowing. Winter cover crops, contour stripcropping, conservation tillage, wind stripcropping, and field windbreaks help to prevent excessive soil loss. Returning crop residue to the soil or adding other organic material reduces the hazard of soil blowing and the amount of water lost through evaporation, increases the rate of water infiltration, and helps to maintain fertility and good tilth.

A cover of pasture plants is effective in controlling soil blowing. Forage yields are generally low unless fertilizer is applied and the supply of moisture is adequate. Planting early in spring, before the soil has a chance to dry, helps to overcome the droughtiness. Later plantings are likely to have a poor survival rate. Overgrazing can cause surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Measures that improve fertility, proper stocking rates, and pasture rotation help to keep the pasture in good condition.

This soil is suited to trees, especially pines. The equipment limitation and seedling mortality are management concerns. Equipment use is restricted by the loose sand. This restriction can be reduced by using the equipment only when the surface is frozen. Equipment with flotation tires or with tracks has better traction in loose sand than standard wheeled equipment. Sandy areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be stabilized with gravel or crushed rock. Seedling mortality caused by droughtiness can be reduced by careful planting of vigorous nursery stock or by using containerized seedlings. It can also be reduced by planting when the soil is moist.

Because of the wetness and a poor filtering capacity, this soil is poorly suited to septic tank absorption fields. The upper part of the soil readily absorbs the effluent in septic tank absorption fields. It does not adequately filter the effluent, however, because of the rapid permeability. Mounding the site with suitable filtering material helps to overcome the

wetness and the poor filtering capacity. Also, the effluent can be pumped to an absorption field on a better suited soil in nearby areas.

This soil is suited to local roads and streets and to dwellings without basements. Because of the wetness, however, it is only moderately suited to dwellings with basements. This limitation can be overcome by installing tile drains around foundations and providing gravity outlets or other dependable outlets and by constructing the foundations on coarse textured fill material above the level of wetness.

The land capability classification is IIIs. The woodland ordination symbol is 6S (Red pine). The primary forest habitat type commonly is PVCr, and the secondary forest habitat type is ArDe-V.

TwA—Toddville silt loam, 0 to 3 percent slopes

This very deep, nearly level and gently sloping, moderately well drained soil is on stream terraces. Individual areas are oblong or irregularly shaped and generally range from 5 to 120 acres in size.

Typically, the surface layer is very dark brown silt loam about 8 inches thick. The subsurface layer is very dark brown and dark brown silt loam about 9 inches thick. The subsoil is about 38 inches thick. The upper part is dark yellowish brown, friable silt loam. The next part is brown, mottled, friable silt loam. The lower part is yellowish brown and brown, mottled, friable, stratified silt loam, loam, sandy loam, and sand. The substratum to a depth of about 60 inches is brownish yellow, mottled sand that has thin strata of sandy loam. In places the substratum is mostly silt loam.

Included with this soil in mapping are small areas of the well drained Bertrand, moderately well drained Jackson, and somewhat poorly drained Rowley soils. Bertrand and Jackson soils have a thinner, lighter colored surface layer than the Toddville soil. Bertrand soils are in the slightly higher positions on the landscape. Jackson soils are in landscape positions similar to those of the Toddville soil. Rowley soils are in the slightly lower positions. Included soils make up 5 to 15 percent of the unit.

Permeability is moderate in the subsoil of the Toddville soil and rapid in the sandy substratum. The available water capacity is very high. The content of organic matter is moderate or high in the surface layer. The surface layer is friable and can be easily tilled, but it tends to crust and puddle after hard rains or forms clods if it is tilled when too wet. An apparent seasonal high water table is at a depth of 3.5 to 6.0 feet.

This soil is not naturally forested and is not generally managed for woodland. Most areas are used as cropland. The soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Applying a system of conservation tillage and returning crop residue to the soil or adding other organic material can help to maintain fertility and good tilth and increase the rate of water infiltration.

This soil is suited to pasture. The surface layer is subject to crusting, which restricts the emergence of plants. Overgrazing or grazing when the soil is too wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, pasture rotation, measures that improve fertility, and restricted use during wet periods help to keep the pasture in good condition.

Because of the wetness, this soil is poorly suited to septic tank absorption fields. This limitation can be overcome by constructing a filtering mound of suitable material. Also, the effluent can be pumped to an absorption field on a better suited soil in nearby areas.

Because of the shrink-swell potential, this soil is only moderately suited to dwellings. This limitation can be overcome by excavating the soil and replacing it with coarse textured material, such as sand or gravel; by strengthening the basement walls; and by installing a subsurface drainage system around the dwellings at or below the basement elevation. The wetness is a limitation on sites for dwellings with basements. It can be overcome by constructing the foundations on coarse textured fill material above the level of wetness or by installing tile drains around foundations and providing gravity outlets or other dependable outlets.

Because of low strength and the potential for frost action, this soil is poorly suited to local roads and streets. Low strength can be overcome by replacing the upper part of the soil with coarse textured base material, such as sand or gravel, and by increasing the thickness of the pavement or base material. Installing a subsurface drainage system and replacing part of the soil with coarse base material help to prevent the damage caused by frost action.

The land capability classification is I. No woodland ordination symbol or forest habitat type is assigned.

UdF—Udorthents, loamy, very steep

These steep and very steep, severely eroded soils are on back slopes and foot slopes of gullies that have been eroded in stream terraces. Perennial or

intermittent streams have removed most of the topsoil and subsoil, resulting in a network of gullies ranging in depth from 10 to 100 feet. Individual areas of this unit are long and narrow and generally range from 5 to 400 acres in size.

The soil texture and colors and the thickness of the individual soil layers vary greatly. Typically, the texture is silt loam, loam, or sandy loam. In places the soils have strata of loamy sand or sand.

Permeability is generally moderate or moderately rapid. The available water capacity is high. The content of organic matter is low or very low in the surface layer.

Most areas are wooded. These soils are not suited to crops or pasture because of the very severe hazard of water erosion. Installing diversions, fencing livestock out of the area, and constructing toe walls and dams help to control water erosion.

These soils are suited to trees. The hazard of erosion and the equipment limitation are management concerns. Erosion is severely accelerated where runoff is concentrated on skid trails, log landings, and haul roads. Establishing log landings and haul roads in adjacent areas and constructing skid trails on the contour help to control erosion. Erosion also can be controlled by seeding areas where logging has exposed the surface.

Equipment use is restricted by the slope. Skid trails can be designed so that they conform to the topography and so that grades are kept as low as possible. In very steep areas, it may be necessary to yard the logs by cable. Most areas of this soil are long and narrow, so log landings and haul roads can easily be established in areas of better suited adjacent soils. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or mechanical removal.

These soils generally are not suitable as sites for septic tank absorption fields, dwellings, or local roads and streets, mainly because of the slope. Overcoming this hazard is difficult. A better suited site should be selected.

The land capability classification is VIIe. No woodland ordination symbol or forest habitat type is assigned.

UfC2—Urne fine sandy loam, 6 to 12 percent slopes, eroded

This moderately deep, sloping, well drained soil is on shoulders and back slopes of knolls, ridges, and hills. Individual areas are long and narrow or irregularly shaped and generally range from 5 to 80 acres in size.

In most cultivated areas, erosion has removed much of the original surface layer. Typically, the remaining surface layer is dark brown fine sandy loam about 7 inches thick. It is mixed with some brown subsoil material. The subsoil is about 21 inches thick. The upper part is dark brown, friable fine sandy loam, and the lower part is dark brown, very friable channery fine sandy loam. The upper part of the substratum is grayish green loamy fine sand about 8 inches thick. The lower part to a depth of about 60 inches is weakly cemented, fine grained glauconitic sandstone. In places the surface layer is channery sandy loam, loam, or silt loam. In some areas the slope is less than 6 percent or more than 12 percent.

Included with this soil in mapping are small areas of the somewhat excessively drained Elevasil and well drained La Farge soils. Elevasil soils are in the lower positions on the landscape. They are underlain by sand and nonglauconitic sandstone. La Farge soils are in landscape positions similar to those of the Urne soil. They have more silt and clay in the surface layer and subsoil than the Urne soil. Included soils make up 5 to 15 percent of the unit.

Permeability is moderate or moderately rapid in the subsoil of the Urne soil and slow to moderate in the underlying fine grained glauconitic sandstone. The available water capacity is low. The content of organic matter is low in the surface layer. The surface layer is friable and can be easily tilled throughout a wide range in moisture content. The rooting depth of most crops is limited by the underlying sandstone.

Most areas are used as cropland or pasture. A few areas are wooded. This soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. In most years crop yields are limited by the low available water capacity. The soil is poorly suited to irrigation because of the slope. If cultivated crops are grown, water erosion is a moderate hazard. Also, the soil is subject to soil blowing. Contour farming, contour stripcropping, winter cover crops, and conservation tillage help to prevent excessive soil loss. Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth, increases the rate of water infiltration, and helps to control water erosion and soil blowing.

A cover of pasture plants is effective in controlling water erosion and soil blowing. Overgrazing can cause surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, pasture

rotation, measures that improve fertility, and timely deferment of grazing help to keep the pasture in good condition.

This soil is suited to trees. Equipment use at log landings is restricted by the slope. Log landings can be established in the nearly level or gently sloping included or adjacent areas. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or mechanical removal.

Because of seepage and a thin layer over bedrock, this soil is poorly suited to septic tank absorption fields. These limitations can result in the pollution of ground water. Mounding the site with suitable filtering material helps to overcome the limitations. Also, the effluent can be pumped to an absorption field on a better suited soil in a nearby area.

Because of the slope, this soil is only moderately suited to dwellings. This limitation can be overcome by cutting and filling, by installing retaining walls, or by designing the dwellings so that one side of the basement fronts on the lower part of the slope. Also, the dwellings can be constructed in the less sloping included areas.

Because of the slope and the potential for frost action, this soil is only moderately suited to local roads and streets. The slope can be overcome by shaping the roadway through cutting and filling. Also, the roads can be built in the less sloping areas. Replacing the upper part of the soil with coarse textured base material, such as sand or gravel, helps to prevent the damage caused by frost action.

The land capability classification is IIIe. The woodland ordination symbol is 4A (Northern red oak). The forest habitat type commonly is ArDe-V.

UfD2—Urne fine sandy loam, 12 to 25 percent slopes, eroded

This moderately deep, moderately steep and steep, well drained soil is on shoulders and back slopes of knolls, ridges, and hills. Individual areas are long and narrow or irregularly shaped and generally range from 10 to 100 acres in size.

In most cultivated areas, erosion has removed much of the original surface layer. Typically, the remaining surface layer is dark brown fine sandy loam about 9 inches thick. It is mixed with some dark yellowish brown subsoil material. The subsoil is dark yellowish brown, very friable fine sandy loam about 14 inches thick. The upper part of the substratum is light olive brown loamy fine sand about 8 inches thick. The lower part to a depth of about 60 inches is weakly cemented, fine grained glauconitic sandstone. In places the surface layer is channery sandy loam, loam, or silt loam. In some areas the slope is less than 12 percent or more than 25 percent.

Included with this soil in mapping are small areas of the somewhat excessively drained Elevasil and well drained La Farge soils. Elevasil soils are in the lower positions on the landscape. They are underlain by sand and glauconitic sandstone. La Farge soils are in landscape positions similar to those of the Urne soil. They have more silt and clay in the surface layer and subsoil than the Urne soil. Included soils make up 10 to 15 percent of the unit.

Permeability is moderate or moderately rapid in the subsoil of the Urne soil and slow to moderate in the underlying fine grained glauconitic sandstone. The available water capacity is low. The content of organic matter is low in the surface layer. The surface layer is friable and can be easily tilled throughout a wide range in moisture content. The rooting depth of most crops is limited by the underlying sandstone.

Most areas are wooded. A few areas are used as cropland or pasture. This soil is suited to corn and small grain and to grasses and legumes for hay and pasture. In most years crop yields are limited by the low available water capacity. The soil is not suited to irrigation because of the slope. If cultivated crops are grown, erosion is a severe hazard. Also, the soil is subject to soil blowing. Contour farming, contour stripcropping, crop rotations that include grasses and legumes, and conservation tillage help to prevent excessive soil loss. Returning crop residue to the soil or adding other organic material helps to maintain fertility and good tilth, increases the rate of water infiltration, and helps to control water erosion and soil blowing.

A cover of pasture plants is effective in controlling water erosion and soil blowing. Overgrazing can cause surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, pasture rotation, measures that improve fertility, and timely deferment of grazing help to keep the pasture in good condition.

This soil is suited to trees. The erosion hazard and the equipment limitation are management concerns. Erosion is accelerated where runoff is concentrated on skid trails, log landings, and haul roads. Removing water with water bars, establishing out-sloping road surfaces, crowning the road surfaces, providing ditches and culverts, and establishing skid trails and haul roads on the contour help to control erosion. Erosion also can be controlled by seeding areas where logging has exposed the surface.

Equipment use is restricted by the slope. Skid trails and haul roads can be designed so that they conform to the topography and so that grades are kept as low as possible. Log landings can be established in nearly level or gently sloping included or adjacent areas. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or mechanical removal.

Because of seepage, a thin layer over bedrock, and the slope, this soil is poorly suited to septic tank absorption fields. The thin layer and seepage can be overcome by mounding the site with suitable filtering material. The slope can be overcome by cutting and filling or by installing a trench absorption system on the contour or in the less sloping included areas.

Because of the slope, this soil is poorly suited to dwellings. This limitation can be overcome by cutting and filling, by installing retaining walls, or by designing the dwellings so that one side of the basement fronts on the lower part of the slope. Also, the dwellings can be constructed in the less sloping included areas.

Because of the slope, this soil is poorly suited to local roads and streets. This limitation can be overcome by shaping the roadway through cutting and filling. Also, the roads can be built in the less sloping included areas.

The land capability classification is IVe. The woodland ordination symbol is 4R (Northern red oak). The forest habitat type commonly is ArDe-V.

UrF—Urne-Council complex, 25 to 50 percent slopes

These soils are steep and very steep. The well drained, moderately deep Urne soil is on shoulders and the steeper back slopes of knolls, ridges, and hills. The well drained, very deep Council soil is on back slopes, foot slopes, and head slopes. The Urne and Council soils occur as areas so intricately mixed or so small that it was not practical to map them separately. Individual areas are long and narrow or irregularly shaped and generally range from 10 to 1,000 acres in size. They are 45 to 55 percent Urne soil and 25 to 35 percent Council soil.

Typically, the surface layer of the Urne soil is black fine sandy loam about 2 inches thick. It is covered by about 1 inch of very dark grayish brown mucky peat, which is a mat of partially decomposed forest litter. The subsoil is olive brown and light olive brown, friable fine sandy loam about 34 inches thick. The substratum to a depth of about 60 inches is weakly cemented, fine grained glauconitic sandstone. In places the surface layer is sandy loam, silt loam, or channery sandy loam.

Typically, the surface layer of the Council soil is very dark grayish brown loam about 4 inches thick. It is covered by about 1 inch of very dark grayish brown mucky peat, which is a mat of partially decomposed forest litter. The subsurface layer is dark yellowish brown loam about 8 inches thick. The subsoil is about 24 inches thick. It is dark yellowish brown and friable and is mottled in the lower part. The upper part is loam, and the lower part is stratified loam and silt loam. The substratum to a depth of about 60 inches is yellowish brown, mottled silt loam. The mottles in the lower part of the subsoil and in the substratum are relict and are not associated with a seasonal high water table. In places the surface layer is sandy loam or fine sandy loam.

Included with these soils in mapping are small areas of the well drained Elevasil, La Farge, and Seaton soils. Elevasil soils are in landscape positions similar to those of the Urne soil but are at slightly lower elevations. They are underlain by sand and nonglauconitic sandstone. La Farge and Seaton soils are in landscape positions similar to those of the Council soil. La Farge soils have more silt and clay in the surface layer and subsoil than the Council soil and have sandstone at a depth of 20 to 40 inches. Seaton soils are silty throughout. Included soils make up 10 to 20 percent of the unit.

Permeability is moderate or moderately rapid in the subsoil of the Urne soil and slow to moderate in the underlying fine grained glauconitic sandstone. It is moderate in the Council soil. The available water capacity is low in the Urne soil and high in the Council soil. The content of organic matter is low or moderately low in the surface layer of the Urne soil and moderately low in the surface layer of the Council soil. The rooting depth for most plants is limited by the sandstone bedrock in the Urne soil.

Most areas are wooded. These soils are not suited to cultivated crops or pasture because of the slope and a very severe hazard of water erosion. The soils are suited to trees. The erosion hazard and equipment limitations are management concerns. Erosion is accelerated where runoff is concentrated on skid trails, log landings, and haul roads. Removing water with water bars, establishing out-sloping road surfaces, crowning the road surfaces, providing culverts and ditches, and establishing skid trails and haul roads on the contour help to control erosion. Erosion can also be controlled by seeding areas where logging has exposed the surface.

Equipment use is severely restricted by the slope. Skid trails and haul roads can be designed so that they conform to the topography and so that grades are kept as low as possible. In very steep areas, it may be necessary to yard the logs by cable. Log landings can be established in the nearly level or gently sloping included or adjacent areas. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal. Skidding can also destroy competing vegetation and expose enough mineral soil to allow rapid natural regeneration.

These soils generally are not suitable as sites for septic tank absorption fields, dwellings, or local roads and streets, mainly because of the slope. Overcoming this limitation is difficult. It may be possible to use the small, less sloping included areas for these uses, but in general a better suited site should be considered.

The land capability classification is VIIe. The woodland ordination symbol is 4R (Northern red oak). The forest habitat type commonly is ArDe-V for the Urne soil and ArCi for the Council soil.

Vs—Veedum-Elm Lake mucks, 0 to 2 percent slopes

These moderately deep, nearly level, poorly drained soils are in drainageways and depressions. The Veedum and Elm Lake soils occur as areas so intricately mixed or so small that it was not practical to map them separately. Individual areas are long and narrow or irregularly shaped and generally range from 10 to 60 acres in size. They are about 45 to 55 percent Veedum soil and 30 to 40 percent Elm Lake soil.

Typically, the surface layer of the Veedum soil is black muck about 7 inches thick. The subsurface layer is dark grayish brown, mottled silt loam about 4 inches thick. The subsoil is about 20 inches thick. It is mottled. It is stratified dark grayish brown, friable loam and light brownish gray, firm silty clay loam. The substratum to a depth of about 60 inches is weakly cemented interbedded sandstone and shale. In places the surface layer is mucky silt loam, silt loam, or loam.

Typically, the surface layer of the Elm Lake soil is dark reddish brown muck about 6 inches thick. The substratum is about 32 inches thick. It is grayish brown and very pale brown sand in the upper part and dark gray, mottled loam in the lower part. The substratum to a depth of about 60 inches is weakly cemented interbedded sandstone and shale. In places the surface layer is mucky sand, mucky loamy sand, or loamy sand.

Included with these soils in mapping are small areas of the very poorly drained Citypoint and poorly drained Ponycreek soils. Citypoint soils are in the slightly lower positions on the landscape. They formed in 16 to 51 inches of organic material. Ponycreek soils are in landscape positions similar to those of the Veedum and Elm Lake soils. They are sandy throughout. Included soils make up 5 to 20 percent of the unit.

Permeability is moderate in the upper part of the subsoil in the Veedum soil, moderately slow or moderate in the lower part of the subsoil, and extremely slow to moderately slow in the underlying interbedded sandstone and shale. It is rapid in the sandy upper part of the substratum in the Elm Lake soil, moderately slow or moderate in the loamy lower part of the substratum, and extremely slow to moderately slow in the underlying interbedded sandstone and shale. The available water capacity is moderate in the Veedum soil and low in the Elm Lake soil. The content of organic matter is very high in the surface layer of both soils. The rooting depth of most plants is limited by the perched seasonal high water table, which is near or above the surface, and by the interbedded sandstone and shale.

Most areas support native wetland vegetation. A few areas are wooded. These soils are suited to some conifers but are poorly suited to most other trees. Most trees grow slowly and are poorly shaped. The equipment limitation, seedling mortality, and the windthrow hazard are management concerns.

Equipment use is restricted by wetness and by low soil strength. These restrictions can be reduced by using equipment during dry periods or during periods when the surface is frozen or has adequate snow cover. Equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Areas subject to repeated use by heavy equipment, such as log landings and haul roads, can be strengthened with gravel or crushed rock or can be established in better suited included or adjacent areas. Culverts and ditches can be used to maintain natural drainage systems along haul roads. Seedling mortality caused by wetness can be reduced by careful machine planting on prepared ridges or by hand planting on cradle knolls and in the drier included areas. Selecting vigorous nursery stock for

planting also reduces the seedling mortality rate. Harvesting by clearcut or area-selection methods helps to prevent windthrow of the remaining trees. Maintaining permanent all-season haul roads allows quick salvage of downed trees after periodic storms. Competing vegetation, which interferes with tree planting and natural regeneration following harvest, can be controlled by herbicides or by mechanical removal.

These soils generally are not suitable as sites for septic tank absorption fields, dwellings, or local roads and streets, mainly because of the ponding. Overcoming the ponding is difficult. A better suited site should be considered.

The land capability classification is VIw. The woodland ordination symbol is 1W (Black ash) for the Veedum soil and 3W (Red maple) for the Elm Lake soil. No forest habitat type is assigned.

WmA—Whitehall silt loam, 0 to 3 percent slopes

This very deep, nearly level and gently sloping, moderately well drained soil is in drainageways and depressions. It is subject to rare flooding. Individual areas are irregular in shape and generally range from 4 to 60 acres in size.

Typically, the surface layer and the subsurface layer are dark brown silt loam about 12 inches thick. The subsoil is about 20 inches thick. It is dark brown and reddish brown, friable silt loam in the upper part and reddish brown, friable loam in the lower part. The substratum to a depth of about 60 inches is reddish yellow, mottled sand. In places the surface layer is thinner. In some areas the surface layer and the upper part of the subsoil are loam.

Included with this soil in mapping are small areas of the well drained Dunnville soils in the higher positions on the landscape. These soils have more sand in the surface layer and subsoil than the Whitehall soil. They make up 5 to 15 percent of the unit.

Permeability is moderate in the silty and loamy subsoil of the Whitehall soil and rapid or very rapid in the sandy substratum. The available water capacity is moderate. The content of organic matter is moderate in the surface layer. The surface layer is friable and can be easily tilled, but it tends to crust and puddle after hard rains or forms clods if it is tilled when too wet. An apparent seasonal high water table is at a depth of 3.5 to 6.0 feet. The rooting depth of most crops is limited by the sandy substratum.

This soil is not naturally forested and is generally not managed for trees. Most areas are used as cropland. The soil is suited to corn, soybeans, and small grain and to grasses and legumes for hay and pasture. Droughtiness is a slight hazard. Applying a system of conservation tillage and returning crop residue to the soil or adding other organic material can help to maintain fertility and good tilth and increase the rate of water infiltration.

This soil is suited to pasture. The surface layer is subject to crusting, which restricts the emergence of plants. Overgrazing or grazing when the soil is too wet causes surface compaction, depletion of the plant cover, and an increase in the extent of undesirable plant species. Proper stocking rates, measures that improve fertility, and restricted use during wet periods help to keep the pasture in good condition.

Because of wetness and a poor filtering capacity, this soil is poorly suited to septic tank absorption fields. It readily absorbs the effluent in septic tank absorption fields, but it does not adequately filter the effluent because of the rapid permeability. The poor filtering capacity can result in the pollution of ground water. Mounding the site with suitable filtering material helps to overcome the wetness and the poor filtering capacity. Also, the effluent can be pumped to an absorption field on a better suited soil in nearby areas.

Because of the flooding, this soil is poorly suited to dwellings. Overcoming this limitation is difficult. It may be possible to use included areas for this use, but a better suited site should be considered.

Because of low strength and the potential for frost action, this soil is poorly suited to local roads and streets. Low strength can be overcome by replacing the upper part of the soil with coarse textured base material, such as sand or gravel, and by increasing the thickness of the pavement or base material. Installing a subsurface drainage system and replacing part of the soil with a coarse textured base material help to prevent the damage caused by frost action.

The land capability classification is IIs. No woodland ordination symbol or forest habitat type is assigned.

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Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help to prevent soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreational facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Crops and Pasture

Stephen A. Rake, district conservationist, Natural Resources Conservation Service, helped prepare this section.

General management needed for crops and pasture is suggested in this section. The estimated yields of the main crops and pasture plants are listed for each soil, the system of land capability classification used by the Natural Resources Conservation Service is explained, and prime farmland is described.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under the heading "Detailed Soil Map Units." Specific information can be obtained from the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

In 1989, about 252,000 acres in Jackson County was farmland. About 160,000 acres was used as cropland, and the rest was pasture or woodland. Of the total acreage used as cropland, about 39,000 acres was used for corn; 14,000 acres for small grain, mainly oats; 6,000 acres for soybeans; 55,000 acres for hay, mainly alfalfa; and 3,000 acres for fruit and vegetable crops (Wisconsin Department of Agriculture, Trade, and Consumer Protection/USDA, 1990). The rest was mostly idle cropland. Most of the farmland is in the western half of the county.

The potential of the soils in Jackson County for increased production of food is good. About 14,000 acres of potentially good cropland is used as pasture, and about 32,000 acres is used as woodland (USDA, 1970). Food production could be increased considerably by extending the latest crop production technology to all of the cropland in the county. This soil survey can greatly facilitate the application of such technology.

The paragraphs that follow describe the main concerns in managing the soils in the county for crops and pasture. These management concerns are water erosion, soil blowing, wetness, fertility, and tilth (fig. 12).

Water erosion is the major management concern on about 50 percent of the cropland and pasture in the western part of the county. It generally is a hazard where slopes are more than 4 percent and are more than 100 feet in length.

Loss of the surface layer through erosion is damaging for three major reasons. First, productivity is reduced as the surface layer is lost and part of the

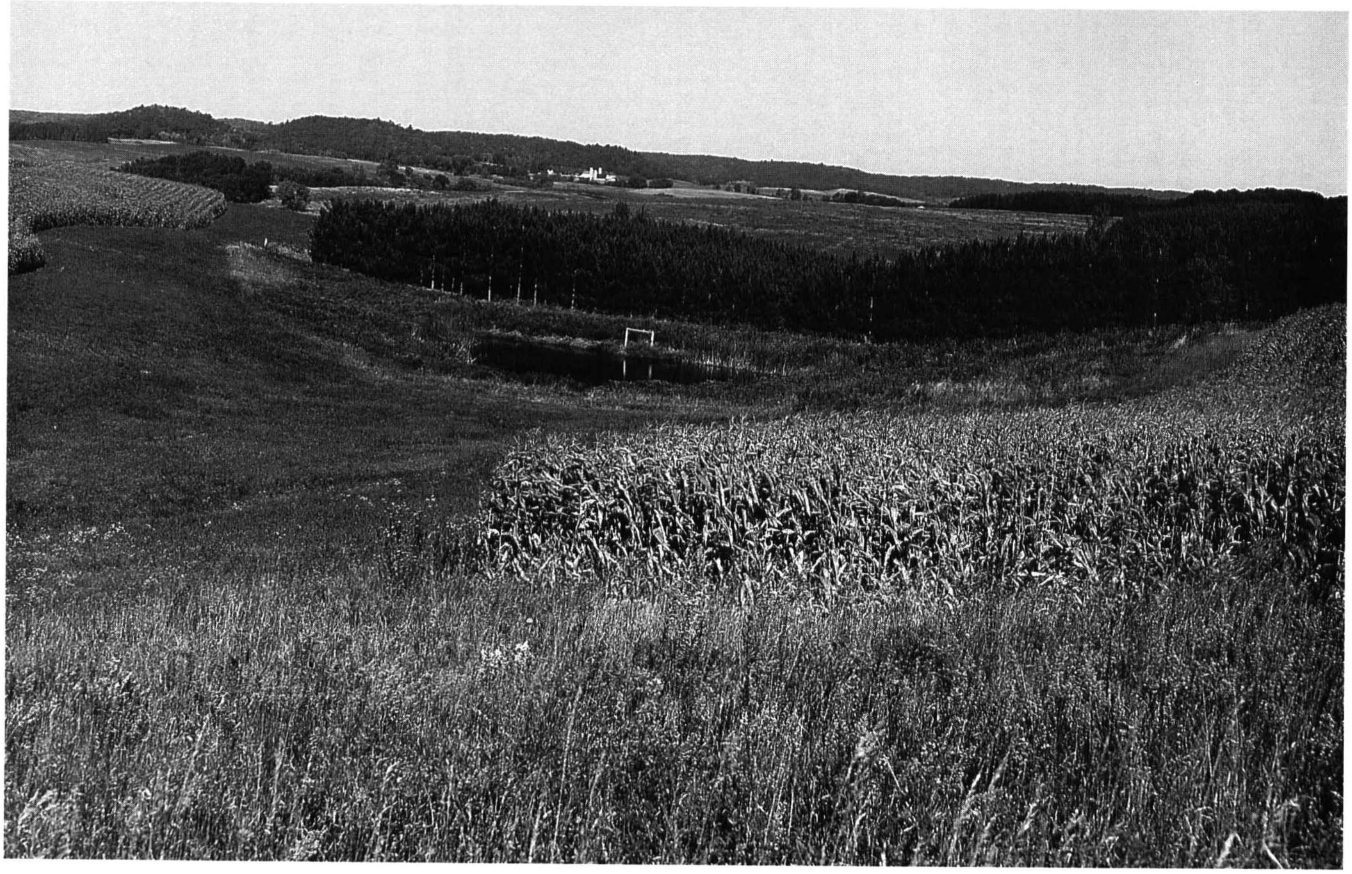

Figure 12.—Conservation management practices in an area of Council and Seaton soils. The pond, contour stripcropping, grassed waterways, and pine plantations help to control runoff and erosion. The pond and the pine plantation also provide wildlife habitat.

subsurface layer or subsoil is incorporated into the plow layer. The surface layer contains more organic matter than other parts of the soil. Second, incorporation of material from the subsurface layer or subsoil can result in poor tilth and crusting, which in turn can result in poor seed germination or poor seedling emergence. Third, erosion can result in the sedimentation of streams. Controlling erosion minimizes this pollution and improves the quality of water for farm and municipal uses, for recreation, and for fish and wildlife.

Erosion-control measures provide a protective ground cover, reduce the runoff rate, and increase the rate of water infiltration. A cropping system that maintains a plant cover on the surface for extended periods can help to hold soil losses to an amount that does not reduce the productive capacity of the soils. On livestock farms, where pasture and hay are needed, including grasses and legumes in the cropping sequence not only provides nitrogen and improves tilth but also reduces the hazard of erosion.

Conservation tillage systems are very effective in controlling runoff and erosion and increasing the rate of water infiltration. Using a chisel plow, a disk, or other conservation tillage equipment can leave 30 to 50 percent of the surface covered with plant residue. This residue helps to prevent the displacement and movement of soil particles. No-till planting is also effective in controlling erosion. Under this system, only a small slot is dug where the seed is planted and a residue cover of 50 to 90 percent is possible. Conservation tillage systems can be used on most of the soils in the county.

In Jackson County, contour farming and contour stripcropping are the main practices used to control erosion in areas where slopes are 4 to 20 percent. Contour stripcropping involves alternating strips of corn, soybeans, or small grain with hay. The strips, planted on the contour, help to control runoff and erosion and increase the rate of water infiltration. Contour farming and contour stripcropping are well suited to most soils and can be used with feed grain-hay rotations, which are common in dairy farming.

Terraces and diversions reduce the length of

slopes and thus help to control erosion. These structures are not common in Jackson County because they are most practical in areas of deep soils that have uniform slopes. Only a few areas in the county, mainly areas of Council and Seaton soils, are suitable for terraces.

Soil blowing is a hazard on sandy soils, such as Boone, Gosil, Rockdam, and Tarr soils; on loamy soils, such as Bilmod, Bilson, and Humbird soils; and in drained areas of organic soils, such as Adder, Dawsil, and Loxley soils. Soil blowing can damage the soils and any young plants in just a few hours if the winds are strong and the soils are dry and are not protected by vegetation or crop residue. Maintaining a cover of plants or crop residue, wind stripcropping, and establishing field windbreaks help to control soil blowing.

Information about the design of erosion-control measures for each soil in the county is provided in the Technical Guide, which is available in the local office of the Natural Resources Conservation Service.

Wetness is the major management concern on about 7 percent of the acreage used for crops or pasture in the county. Some soils are naturally so wet that they generally cannot be used for the crops commonly grown in the county unless they are drained. Examples are the very poorly drained organic soils, such as Dawsil, Houghton, and Loxley soils, and the poorly drained mineral soils, such as Elm Lake, Ettrick, Newlang, and Ponycreek soils. Unless they are drained, Coffton, Fairchild, Ironrun, Merrillan, and other somewhat poorly drained soils are wet enough that crops are damaged during most years.

The design of both surface and subsurface drainage systems varies, depending on soil properties and site conditions. A combination of surface and subsurface drains is needed in most areas of the poorly drained and very poorly drained soils used intensively for row crops. Diversions are needed in some areas to remove runoff from the adjacent fields. In areas of soils that are underlain by stratified silt and very fine sand or fine sand, special covering is needed over the drainage tile to prevent the material from the substratum from filling and clogging the tile.

If organic soils are used as cropland, special management measures are necessary. These soils oxidize and subside when water is removed. Drainage systems that control the depth and period of drainage are needed. Keeping the water table at the level required for crop growth during the growing season and raising it to the surface during other parts of the year minimize the oxidation and subsidence of these soils.

Further information about the design of drainage systems is provided in the Technical Guide, which is available in the local office of the Natural Resources Conservation Service.

Soil fertility varies in the soils of Jackson County, depending on the natural fertility and cropping history. Most of the soils are naturally acid. Applications of lime may be needed to neutralize the acidity of these soils. Available phosphorus and potassium levels are naturally low or medium in most of the soils. On all soils, additions of lime or fertilizer should be based on the results of soil tests, the needs of the crop, and the expected level of yields. The Cooperative Extension Service can help in determining the kinds and amounts of nutrients and lime to be applied.

Soil tilth is an important factor affecting the germination of seeds, the emergence of seedlings, and the infiltration of water into the soils. Soils that have good tilth are granular and porous. Tilling and grazing during wet periods can result in poor tilth in areas of Jackson and Seaton soils and in areas of other soils that have a surface layer of silt loam. If the surface is bare, a surface crust can form during periods of heavy rainfall. This crust reduces the rate of water infiltration and increases the runoff rate and the hazard of erosion. Maintaining tilth is especially difficult on eroded soils because they have a lower content of organic matter than uneroded soils. Returning crop residue to the soil, growing green manure crops, and regularly adding manure improve tilth and minimize crusting.

Field crops suited to most of the soils and the climate of the county include corn, which is the most commonly grown row crop, and oats, the most common close-growing crop. A limited acreage is used for soybeans, barley, or wheat.

The most commonly grown hay and pasture species are mixtures of alfalfa and bromegrass and of red clover and timothy. Bluegrass is the most common native cool-season pasture species.

Specialty crops grown commercially in the county include sweet corn, peas, snap beans, cucumbers, strawberries, and apples. Most of the well drained soils are suited to these crops. Soils in low areas, where frost is frequent and air drainage is poor, are poorly suited to early vegetables, small fruits, and orchards. Cranberries are also grown in the county, typically in areas of the wetter soils, such as Psammaquents. The most current information about growing specialty crops can be obtained from local

offices of the Cooperative Extension Service and the Natural Resources Conservation Service.

Yields per Acre

David Holcomb, agricultural agent, University of Wisconsin Extension, helped prepare this section.

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. The land capability classification of each map unit also is shown in the table.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Natural Resources Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops (USDA, 1961). Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for woodland or for engineering purposes.

In the capability system, soils are generally grouped at three levels—capability class, subclass, and unit. Only class and subclass are used in this survey.

Capability classes, the broadest groups, are designated by numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main hazard is the risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c,* used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c*

because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, woodland, wildlife habitat, or recreation.

The capability classification of each map unit is given in the section "Detailed Soil Map Units" and in the yields table.

Prime Farmland

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in meeting the Nation's short- and long-range needs for food and fiber. Because the supply of high-quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. It could be cultivated land, pastureland, forest land, or other land, but it is not urban or built-up land or water areas. The soil qualities, growing season, and moisture supply are those needed for the soil to economically produce sustained high yields of crops when proper management, including water management, and acceptable farming methods are applied. In general, prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, an acceptable salt and sodium content, and few or no rocks. It is permeable to water and air. It is not excessively erodible or saturated with water for long periods, and it either is not frequently flooded during the growing season or is protected from flooding. The slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at the local office of the Natural Resources Conservation Service.

More than 70,000 acres in Jackson County is prime farmland or potential prime farmland. Most of this land is in the western part of the county, mainly in areas of associations 2 and 5, which are described under the heading "General Soil Map Units." Most of the prime farmland is used for crops, mainly corn, soybeans, and alfalfa. These crops account for an estimated 50 percent of the total agricultural income of the county each year.

The map units in the survey area that are considered prime farmland are listed in table 6. This list does not constitute a recommendation for a particular land use. On some soils included in the list, measures that overcome a hazard or limitation, such as flooding, wetness, and droughtiness, are needed. Onsite evaluation is needed to determine whether or not the hazard or limitation has been overcome by corrective measures. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps. The soil qualities that affect use and management are described under the heading "Detailed Soil Map Units."

Woodland Management and Productivity

Robert J. Hess, Jackson County forester, helped prepare this section.

Before the survey area was settled, it consisted of three major plant communities—oak savanna in the western half of the county and pine savanna and a conifer-hardwood forest in the eastern half of the county (Curtis, 1959). Most of the original plant communities are gone as a result of logging, clearing the land for agriculture, cultivating, and other activities. At present, 378,000 acres, or about 59 percent of the county, is forest land. Of this acreage, 371,400 acres is commercial forest (Hahn, 1985).

Today, the woodland is dominated by three major forest types—oak-hickory, which makes up about 148,000 acres; conifers (mostly jack pine, red pine, white pine, black spruce, and tamarack), about 110,000 acres; and aspen, about 61,000 acres (Hahn, 1985). The rest of the woodland consists of mostly maple-birch, paper birch, and elm-ash-soft maple.

About 57 percent of the commercial forests are privately owned and are mostly farm woodlots. The rest is mainly county owned, but there are some extensive tracts of Federal and State lands. Most of the publicly owned land is in the eastern part of the county.

In the western part of the county, the oak-hickory forest type is the most important commercial forest (fig. 13). It is common in associations 2, 3, and 5, which are described under the heading "General Soil Map Units." The elm-ash-soft maple type is common in association 1. The northern pin oak and conifer types are common in associations 4 and 5. The conifer, aspen, and maple-birch types are common in associations 6, 7, 8, and 10. Conifers, such as black spruce and tamarack, are common in some areas of association 9.

Forest fires are controlled by a well organized

Figure 13.—Red oak in an area of the Seaton-Council association in western Jackson County.

suppression system. The most important management needs are the harvest of mature hardwood timber and the removal of defective trees and trees of less valuable species. Harvests should be followed by stand treatment that encourages proper forest reproduction. Also, many pine plantations on sandy soils are now old enough to need pruning and thinning. Improved forest management would greatly enhance many privately owned stands.

Management of the soils in Jackson County for wood crops should be based on the species in the stand, the suitability of the soils for the species, and the objectives of the landowners. The best alternative generally is even-aged management. In the past this type of management has proven acceptable for regenerating all hardwood species, including northern red oak. Even-aged management can also be used to favor white pine, red pine, and jack pine. Selective harvesting may be needed in stands that are

converting to northern hardwood species and in certain stands of northern red oak. Management should include controlling erosion, planting trees where natural regeneration is unreliable, controlling plant competition, improving seedling survival, minimizing windthrow on the wetter sites, harvesting in a timely manner, controlling the damage caused by insects and diseases, removing cull trees and undesirable species, and maintaining an optimum stocking of forest stands, either through thinning or planting (USDA, National Forestry Manual).

Erosion can occur as a result of site preparation and tree harvest if the soil is exposed along logging roads and skid trails and on landings. Burned areas also are subject to erosion. Erosion is accelerated where the runoff is concentrated on skid trails, log landings, and haul roads. Removing water with water bars, establishing out-sloping road surfaces, crowning the road surfaces, providing ditches and culverts, and establishing skid trails and haul roads on the contour help to control erosion. Erosion also can be controlled by seeding areas where logging activities have exposed the soil surface.

Slope may limit the use of forestry equipment if it is 15 percent or more. Equipment can be used more effectively if skid trails, log landings, and haul roads are designed so that they conform with the topography and so that grades are as low as possible. Also, equipment with flotation tires or with tracks has better traction than standard wheeled equipment. Machine planting on moderately steep slopes is difficult. Reforestation on steep and very steep slopes is generally limited to hand planting or natural regeneration. Special harvesting systems, such as skidding and yarding with cable, are needed on very steep slopes.

Soil wetness is a result of a high water table, flooding, or ponding. It causes seedling mortality, limits the use of equipment, increases the extent of undesirable plants following harvest, and increases the windthrow hazard by restricting the rooting depth of some trees. Wetness is a problem in forested areas of poorly drained and very poorly drained soils. It is also a problem to a lesser degree in forested areas of somewhat poorly drained soils. In most areas of these soils, trees can be harvested only when the ground is frozen or has an adequate snow cover or during dry periods of the growing season when the somewhat poorly drained or poorly drained soils are dried out. Traction can be improved on these wet soils if equipment with flotation tires or with tracks is used and if log landings and haul roads are stabilized with gravel or crushed rock. Installing culverts in intermittent and perennial streams also helps to stabilize haul roads.

In areas of poorly drained and very poorly drained soils, wetness during the planting season limits most reforestation to natural regeneration or hand planting on cradle knolls and in the small, drier included areas. Machine planting on prepared ridges is possible in a few areas. Selecting vigorous nursery stock for planting reduces the seedling mortality rate. Harvesting by clearcut, area-selection, or strip-cut methods helps to prevent windthrow of the remaining trees. Strip-cut harvest also promotes natural regeneration. Maintaining permanent haul roads in areas subject to windthrow allows quick salvage of downed trees after storms. Competing vegetation, which interferes with natural regeneration following harvest, can be controlled by herbicides or by mechanical removal. Skidding can also destroy competing vegetation and expose enough mineral soil for rapid regeneration.

Soil droughtiness can cause seedling mortality. Seedling survival during dry periods can be improved by planting vigorous nursery stock if natural regeneration is unreliable and by early planting and proper care of nursery stock prior to planting. Reinforcement planting may be needed. Containerized seedlings may be desirable on very dry sites. Steep and very steep slopes that face south and west are especially droughty because of high temperatures and the rapid evaporation rate. Applications of lime and fertilizer may improve seedling survival but are generally not considered economically feasible.

Tables 7 and 8 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. Table 7 lists the ordination symbol for each soil. Soils assigned the same ordination symbol, based on the same indicator tree species, require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for an indicator tree species. The number indicates the volume, in cubic meters per hectare per year, which the indicator species can produce in a pure stand under natural conditions. The number 1 indicates low potential productivity; 2 or 3, moderate; 4 or 5, moderately high; 6 to 8, high; 9 to 11, very high; and 12 to 39, extremely high. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *R* indicates steep slopes; *X*, stoniness or rockiness; *W*, excess water in or on the soil; *T*, toxic substances in the soil; *D*, restricted

rooting depth; *C*, clay in the upper part of the soil; *S*, sandy texture; *F*, a high content of rock fragments in the soil; *L*, low strength; and *N*, snowpack. The letter *A* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: R, X, W, T, D, C, S, F, L, and N.

In table 7, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Erosion hazard is the probability that damage will occur as a result of site preparation and cutting where the soil is exposed along roads, skid trails, and fire lanes and in log-handling areas. Forests that have been burned or overgrazed are also subject to erosion. Ratings of the erosion hazard are based on the percent of the slope. A rating of *slight* indicates that no particular prevention measures are needed under ordinary conditions. A rating of *moderate* indicates that erosion-control measures are needed in certain silvicultural activities. A rating of *severe* indicates that special precautions are needed to control erosion in most silvicultural activities.

Seedling mortality refers to the death of naturally occurring or planted tree seedlings, as influenced by the kinds of soil, soil wetness, or topographic conditions. The factors used in rating the soils for seedling mortality are the dominant texture in the upper 20 inches of the soil, depth to a seasonal high water table and the length of the period when the water table is high, rock fragments in the upper 20 inches, effective rooting depth, and slope aspect. A rating of *slight* indicates that seedling mortality is not likely to be a problem under normal conditions. Expected mortality is less than 25 percent. A rating of *moderate* indicates that some problems from seedling mortality can be expected. Extra precautions are advisable. Expected mortality is 25 to 50 percent. A rating of *severe* indicates that seedling mortality is a serious problem. Extra precautions are important. Replanting may be necessary. Expected mortality is more than 50 percent.

Windthrow hazard is the likelihood that trees will be uprooted by the wind because the soil is not deep enough for adequate root anchorage. The main restrictions that affect rooting are a seasonal high water table and the depth to bedrock or to other limiting layers. A rating of *slight* indicates that under normal conditions no trees are blown down by the wind. Strong winds may damage trees, but they do not uproot them. A rating of *moderate* indicates that some trees can be blown down during periods when the soil is wet and winds are moderate or strong. A rating of *severe* indicates that many trees can be blown down during these periods.

Plant competition ratings indicate the degree to which undesirable species are expected to invade and grow when openings are made in the tree canopy. The main factors that affect plant competition are depth to the water table and the available water capacity. A rating of *slight* indicates that competition from undesirable plants is not likely to prevent natural regeneration or suppress the more desirable species. Planted seedlings can become established without undue competition. A rating of *moderate* indicates that competition may delay the establishment of desirable species. Competition may hamper stand development, but it will not prevent the eventual development of fully stocked stands. A rating of *severe* indicates that competition can be expected to prevent regeneration unless precautionary measures are applied.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index* and as a *volume* number. The site index is the average height, in feet, that dominant and codominant trees of a given species attain in 50 years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

The *volume*, a number, is the yield likely to be produced by the most important trees. This number, expressed as cubic feet per acre per year, indicates the amount of fiber produced in a fully stocked, even-aged, unmanaged stand.

The first species listed under *common trees* for a soil is the indicator species for that soil. It generally is the most common species on the soil and is the one that determines the ordination class.

Trees to plant are those that are suitable for commercial wood production.

Additional information about woodland management and productivity can be obtained from the county forester, the Wisconsin Department of Natural Resources, the local office of the Natural Resources Conservation Service, or the Cooperative Extension Service.

Table 8 gives information about operating forestry equipment in logging areas and on skid trails, log landings, and haul roads and in site preparation and planting, which includes row seeding. Limitations are given for the most limiting season, which generally is spring in Jackson County. The limitations can also

apply, however, during other excessively wet periods, such as after a heavy rainfall. The preferred operating season is the period when the use of forestry equipment causes the least amount of soil damage. This period generally is when the soil is not too wet or when the ground is frozen.

In table 8, the equipment limitations reflect the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland harvesting and regeneration activities. The chief characteristics and conditions considered in the ratings are soil wetness, the hazard of flooding, rock outcrops, texture of the surface layer, slope, the depth to hard bedrock, the traffic-supporting capacity (or soil strength), and the potential for frost action. Soils that have a moderate or high content of silt have low strength in the extended spring thaw period and during extended periods of high rainfall. Ruts can form easily during these wet periods.

The ratings of *slight, moderate,* and *severe* in the table are based on the use of conventional equipment and procedures. Special procedures or types of equipment can sometimes be utilized to reduce or overcome the site limitations. If wetness is a limitation, for example, using equipment with flotation tires or with tracks helps to prevent the formation of ruts. Restrictions on the use of equipment indicate that accurate timing of operations is needed to avoid seasonal limitations. The cost of operations typically increases as the limitations become more severe. The ratings for log landings and haul roads can be used as a guide for establishing them in the least costly locations.

Logging areas and skid trails include areas where some or all of the trees are being cut. Generally, equipment traffic is least intensive in the logging areas. Skid trails, which generally are within the logging area, are roads or trails over which the logs are dragged or hauled from the stump to a log landing. A rating of slight indicates that the use of conventional equipment is not normally restricted by the physical site conditions. A rating of moderate indicates that the use of equipment or season of use is restricted because of one or more soil factors. A rating of severe indicates that special equipment or techniques are needed to overcome the limitations or that the time of efficient operation is very limited.

Log landings are areas where logs are assembled for transportation. Wheeled equipment may be used more frequently in these areas than in any other areas affected by logging. Considerable soil compaction can be expected in these areas. Good areas for landings require little or no surface preparation or cutting or filling. A rating of slight indicates that the soil is a good site for landings and the area can readily be returned to forest use. A rating of moderate indicates that the season of use is somewhat limited or that such practices as grading, cutting, filling, or drainage are usually required to make the site suitable for a landing and returning the site to forest use is difficult. A rating of severe indicates that the season of use is very limited or that special or expensive techniques are needed to overcome the limitations. There may also be significant risk of environmental damage that makes it very difficult or impossible to return the area to forest use.

Haul roads are access roads leading from log landings to primary or surfaced roads. The haul roads serve as transportation routes for wheeled logging equipment. Generally, they are unpaved roads and are not graveled. The wetter soils and the silty upland soils, which are slippery and can easily become rutted during wet periods, commonly provide poor locations for haul roads. A rating of slight indicates that no serious limitations affect the location, construction, and maintenance of haul roads or the season of use. A rating of moderate indicates some limitations, but the limitations generally can be overcome with routine construction techniques. A rating of severe indicates that establishing and maintaining haul roads on the soil are difficult or expensive or that the season of use may be severely restricted.

Site preparation and planting are the mechanized operations for establishing planted trees in an area. The ratings are based on limitations that affect the efficient use of equipment and the risk of damage to the site caused by the equipment. Operating techniques should not displace or remove topsoil from the site or create channels that can concentrate storm runoff. A rating of slight indicates that no serious limitations affect site preparation and planting. A rating of moderate indicates that the site conditions prevent the efficient use of the equipment or that the site may be damaged by the equipment. A rating of severe indicates that special equipment or techniques, such as hand planting of trees, are needed to overcome the limitations.

Additional information about woodland management and productivity can be obtained from the Wisconsin Department of Natural Resources, the local office of the Natural Resources Conservation Service, or the Cooperative Extension Service.

Forest Habitat Types

John Kotar, senior research scientist, Department of Forestry, University of Wisconsin-Madison, helped prepare this section.

The forest habitat type system used in Jackson County is derived from a field guide developed for northern Wisconsin (Kotar and others, 1988). Publication is planned for a similar guide for southern Wisconsin, which includes Jackson County. The system of habitat classification is based on the concept that plants, including trees, normally occur in predictable patterns or communities and that these communities reflect differences in site characteristics, primarily the moisture content and fertility of the soils. A forest habitat type is an association of dominant tree and ground flora species in a climax plant community. It encompasses all soils capable of producing similar plant communities at climax, which is the stage in ecological development when the vegetative community becomes stable and perpetuates itself.

A habitat type can be identified during most stages of successional growth by examining the reproductive success of various tree species and by inspecting the ground flora, which becomes relatively stable soon after the establishment of a forest canopy. In a young forest, the patterns or associations of understory plants can be used to predict the dominant tree species in the climax forest.

The successional stages and trends also are predictable for the various habitat types. This predictability allows forest managers to make accurate prescriptions for manipulating vegetation based on the ecological potential of the soil rather than on the current forest cover type, which can vary depending largely on how the forest has been managed or disturbed. Additional management implications for each habitat type are in the "Field Guide to Forest Habitat Types of Northern Wisconsin" (Kotar and others, 1988).

Habitat types have been determined for most of the upland map units in Jackson County. Habitat types were not determined for most of the poorly drained or very poorly drained soils. In the western part of the county, the natural vegetation on these soils commonly is grasses, sedges, and brush. In the eastern part the vegetation on the poorly drained or very poorly drained soils is commonly grasses, sedges, or mosses and some small stands of poorly shaped trees.

Habitat types are specified in table 9 and at the end of each map unit description in the section "Detailed Soil Map Units." Although the detailed soil map units do not coincide exactly with habitat types, there is a strong correlation between them. Some map units encompass two ecologically different habitat types. Where two habitat types are associated with a map unit, they are identified as primary and secondary. The primary habitat type is the one that is most common on the map unit. Some small included areas may have a different habitat type from that assigned to the map unit.

Within a given climatic region in Wisconsin, differences in habitat types can be attributed primarily to differences in the moisture-holding capacity and the fertility of the soils. Table 9 lists the forest habitat type for most of the soils in the survey area and the typical nutrient and moisture regime for each habitat type. Nutrient regimes describe the nutrient-supplying capacity of the soil, and moisture regimes describe the combination of the moisture-supplying capacity of the soil and the evaporative demand of the local climate.

The following paragraphs briefly describe the habitat types in Jackson County. The names are derived from the potential climax vegetation on a site. They represent a combination of tree species, which are listed first, and ground flora species. The order is from least productive to most productive.

PVGy—Pinus strobus/Vaccinium angustifolium-Gaylussacia baccata habitat type. The common name is White pine/Low sweet blueberry-Huckleberry. This habitat type represents the droughtiest and least fertile sandy soils in the county. Most stands are dominated by northern pin oak with white oak and red pine or jack pine as common associates. However, any of these species may occur in pure stands or in mixtures. In the absence of fire, white pine appears to be capable of dominating this habitat type.

Ground vegetation on this habitat type is generally sparse. The most abundant species are typically brackenfern, huckleberry, and blueberry. Generally, the PVGy habitat type has higher value for wildlife habitat than for commercial forestry. Only pines, particularly jack pine, have any potential for commercial forestry. Pine tree plantations also have commercial value as Christmas trees.

PVRh—Pinus strobus/Vaccinium angustifolium-Rubus hispidus habitat type. The common name is White pine/Low sweet blueberry-Dewberry. This habitat type represents sandy soils that have a seasonal high water table at a depth of about 1 to 3 feet. White pine appears to be most suited to this type. This species was abundant prior to the logging era. Red maple regenerates most successfully in secondary forests where a white pine seed source is

absent. Pin oak, white oak, and jack pine, individually or in mixtures, are common, but growth is poor.

The dominant understory vegetation is similar to that on the PVGy habitat type, but coverage is higher. The presence of any of the following diagnostic species also helps to distinguish between these two habitat types—swamp dewberry, bunchberry, wintergreen, goldthread, partridgeberry, or cinnamon fern.

Any combination of the naturally occurring tree species in this habitat type provides suitable wildlife habitat for some species. Only white pine, aspen, and red maple have potential for commercial forestry.

PVHa—Pinus strobus/Vaccinium angustifolium-Hamamelis virginiana habitat type. The common name is White pine/Low sweet blueberry-Witch hazel. This habitat type represents soils that formed mostly in sandy deposits and loamy and clayey residuum from the underlying interbedded sandstone and shale and soils that formed mostly in loamy sand that have a seasonal high water table at a depth of about 4 to 6 feet. This habitat type is generally the most productive of those that include sandy soils.

White pine is the presumed climax species on this habitat type, but red oak, white oak, red maple, and aspen also grow well and often occur in mixtures. Many management options for commercial forestry and wildlife habitat exist for this habitat type. The understory species composition is similar to that on the PVRh habitat type, with the following exceptions: mapleleaf viburnum and witch hazel are characteristic of the PVHa type but are not common on the PVRh type, and cinnamon fern, goldthread, bunchberry, and swamp dewberry are absent or scarce on the PVHa habitat type.

PVCr—Pinus strobus/Vaccinium angustifolium-Cornus racemosa habitat type. The common name is White pine/Low sweet blueberry-Gray dogwood. This habitat type is similar to the PVGy habitat type but has some important distinguishing characteristics, such as the presence of gray dogwood, chokecherry, Virginia creeper, or riverbank grape. Huckleberry is typically much less abundant and false Solomons seal more abundant than on the PVGy habitat type.

Pin oak and jack pine are the most common trees, but white oak and black oak commonly dominate second-growth stands. Red oak generally does not occur. White pine reproduces well where a seed source is present and appears to be the climax species on this habitat type. Mixed stands of oaks or of oaks and pines are good choices for wildlife habitat. Jack pine, red pine, and white pine are suited for commercial forestry on this habitat type.

ArDe-V—Acer rubrum/Desmodium glutinosum (Vaccinium angustifolium variant) habitat type. The common name is Red maple/Pointed leaved tick trefoil (Low sweet blueberry variant). This habitat type represents a transition from the predominantly sandy soils to loamy soils that have higher natural fertility and a more favorable moisture regime. A number of understory species characteristic of dry sites occur on this habitat type with relatively low frequency. These include blueberry, brackenfern, wild rose, and whorled loosestrife. The presence of several species that reach their best development on moister, more nutrient-rich sites, such as tick trefoil, hog peanut, wild geranium, and sweet cicely, clearly distinguishes this habitat type from the drier habitat types.

White oak and red maple are the most common dominant species in the present stand. Red oak and black oak are common associates. In the absence of disturbance, red maple would probably become the dominant species because of its shade tolerance. White pine, red pine, and jack pine grow well on this habitat type if red maple competition is controlled.

ArCi—Acer rubrum/Circaea quadrisculata habitat type. The common name is Red maple/Enchanter's nightshade. This habitat type represents the optimal soil conditions for forest productivity in Jackson County. It is the only habitat type where high-quality red oak management is feasible. Most second-growth stands are mixtures of red oak, white oak, and red maple. The presence of such species as basswood, white ash, and sugar maple further distinguishes this habitat type from the drier habitat types. White pine is also suited to this habitat type, but most of the white pine seed source was eliminated by early logging and fires. It is not clear whether sugar maple is capable of domination on this habitat type because its seed source is also scarce. Currently, red maple clearly shows the greatest potential as a climax species.

Regardless of the composition of current stands of trees, the ArCi habitat type can be identified by strong representation of any of the following understory species—enchanter's nightshade, lopseed, sweet cicely, black snakeroot, maidenhair fern, Jack in the pulpit, and elderberry.

Windbreaks and Environmental Plantings

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, help to keep snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To ensure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Table 10 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in table 10 are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from the local office of the Natural Resources Conservation Service, the Wisconsin Department of Natural Resources, or the Cooperative Extension Service or from a commercial nursery.

Recreation

The soils of the survey area are rated in table 11 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreational uses by the duration and intensity of flooding and the season when flooding occurs. In planning recreational facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 11, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or a combination of these measures.

The information in table 11 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 14 and interpretations for dwellings without basements and for local roads and streets in table 13.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

Wildlife Habitat

Robert D. Weihrouch, biologist, Natural Resources Conservation Service, helped prepare this section.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

The paragraphs that follow provide information about wildlife habitat in the ten soil associations in the survey area. The associations themselves are described under the heading "General Soil Map Units."

Association 1.—Most areas of the Absco-Northbend-Kalmarville association are wooded or support native wetland vegetation. Tree species include river birch, silver maple, red maple, swamp white oak, northern pin oak, cottonwood, ash, white pine, and elm.

This association provides important habitat for many bird species, including the tree-nesting wood duck, the threatened red-shouldered hawk, bald eagles, and osprey. The massasauga rattlesnake is an endangered species that inhabits the area. The Black River, creeks, oxbows, and sloughs provide excellent habitat for migrating waterfowl, shorebirds, mink, otter, muskrat, and beaver. The woodland habitat is excellent for fox squirrel, gray squirrel, raccoon, turkeys, ruffed grouse, woodcock, and white-tailed deer.

Associations 2 and 5.—Most areas of the Seaton-Council and Bilson-Elevasil-Merit associations are used as cropland. Areas that are too steep for cultivation are used mostly as pasture or woodland. Northern red oak, hickory, basswood, and white oak are the major tree species. Scattered ash, paper birch, and aspen also occur. A few small, sandy, steep areas support stands of northern pin oak, white pine, or red pine. Wet, brushy or marshy drainageways support willow and alder. Because of the interspersion of woodland and cropland, these associations provide excellent habitat for many species of wildlife, including white-tailed deer, ruffed grouse, wild turkey, fox squirrel, gray squirrel, raccoon, badger, skunk, coyote, gray fox, red fox, and cottontail rabbit. Some pheasants and bobwhite quail are also in areas of these associations. In some areas excessive grazing of woodland limits the abundance of wildlife species that rely on small trees and shrubs. Wild turkeys, which were reintroduced in the area in the 1980's, are thriving.

Association 3.—Most of the more sloping areas of the Urne-Council-La Farge association are used as woodland. The less sloping areas are used mainly as cropland or pasture. Some areas are planted to pine trees. Major tree species include northern red oak, white oak, basswood, white ash, and hickory. Clearings contain aspen, paper birch, and sumac. Because of the interspersion of woodland and cropland, this association provides excellent habitat for many species of wildlife, including white-tailed deer, ruffed grouse, turkeys, cottontail rabbits, raccoon, skunks, red fox, gray fox, red squirrel, and gray squirrel.

Association 4.—Most of the acreage in the Tarr-Boone-Rockdam association is wooded. Some areas in the western part of the county are used as cropland or Christmas tree plantations. The major tree species are jack pine, red pine, white pine, and northern pin oak. Because there is not a large variety of vegetation, the abundance of wildlife species is not as great as in some of the other associations. White-tailed deer, ruffed grouse, turkey, gray fox, skunk, gray squirrel, fox squirrel, and coyote are common species. Some black bear also inhabit the area. The rare Kirtland's warbler, which is an endangered species, is found in the eastern part of the county. Bobwhite quail, red fox, badger, and pocket gophers inhabit the western part of the county.

Associations 6 and 7.—The sandy, mucky, and peaty soils in the Elm Lake-Fairchild and Ironrun-Ponycreek-Dawsil associations occur mostly in the Black River State Forest and the Jackson County Forest. The upland vegetation consists of jack pine, aspen, northern pin oak, and some birch and red maple. The Dike 17 wildlife area has several large developed flowages that attract migrating ducks, geese, sandhill cranes, and great blue heron. These associations are not major waterfowl-production areas, however, because the dark, acidic water is not conducive to waterfowl food production. A small, managed population of sharptail grouse is also thriving here, and beaver are abundant in these areas. White-tailed deer, ruffed grouse, woodcock, snowshoe hare, coyote, and gray fox are common upland species. Some black bear are also in these areas. Wild turkeys, which were reintroduced in the latter part of the 1980's, are thriving. Some rare species, such as the threatened bald eagle and osprey, and the endangered massasauga rattlesnake and Kirtland's warbler are in these associations.

Associations 8 and 10.—Most areas of the

Merrillan-Veedum-Humbird and Kert-Veedum associations are wooded, are used as cropland or pasture, or support native wetland vegetation. The major tree species in these associations are northern red oak, northern pin oak, swamp white oak, red maple, quaking aspen, and jack pine. These associations provide good habitat for many species of wildlife, including white-tailed deer, black bear, ruffed grouse, gray fox, skunk, gray squirrel, fox squirrel, coyote, and snowshoe hare. Generally, the more mature oaks on these soils provide more mast production than the trees in adjoining areas.

Association 9.—The acid organic bogs of the Loxley-Dawsil association are in the far eastern part of the county. The vegetation consists mostly of leatherleaf, sphagnum moss, black spruce, and tamarack. Some commercial cranberry beds are in this association. The ditches and reservoirs needed for cranberry beds provide some wetland habitat for ducks, geese, sandhill cranes, osprey, eagles, and other migratory birds. White-tailed deer and black bear are in areas of this association.

In table 12, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flooding. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flooding, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flooding. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, foxtail, and ragweed.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of these plants are oak, maple, cherry, apple, aspen, dogwood, birch, blackberry, and blueberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are Russian-olive, gray dogwood, highbush cranberry, and crabapple.

Coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, and cedar.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, and slope. Examples of wetland plants are smartweed, wild millet, wildrice, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, slope, and permeability. Examples of

shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. Wildlife attracted to these areas include bobwhite quail, pheasant, meadowlark, song sparrow, cottontail, and red fox.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, deer, and bear.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, otter, muskrat, mink, and beaver.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. Ratings are given for building site development, sanitary facilities, construction materials, and water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section (USDA, National Engineering Handbook). During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kinds of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations (USDA, National Soil Survey Handbook).

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Table 13 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site

features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and depth to the water table.

Dwellings and *small commercial buildings* are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrinking and swelling, and organic layers can cause the movement of footings. A high water table, depth to bedrock, large stones, slope, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 or 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or stabilized soil material; and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic-supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 14 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 14 also shows the suitability of the soils for use as daily cover for landfill. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock, and flooding affect absorption of the effluent. Large stones and bedrock interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local

ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 14 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock, flooding, large stones, and content of organic matter.

Excessive seepage resulting from rapid permeability in the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope and bedrock can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground-water pollution. Ease of excavation and revegetation should be considered.

The ratings in table 14 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, and soil reaction affect trench landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock or the water table to permit revegetation. The soil material used as the final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 15 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help to determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by

large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, a low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have a moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet and have a water table at a depth of less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and *gravel* are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. In table 15, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable, loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are naturally fertile or respond well to fertilizer and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel or stones, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel or stones, have slopes of more than 15 percent, or have a seasonal high water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 16 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and for embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment (fig. 14). Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured

Figure 14.—A pond reservoir area. The dam in the foreground is constructed of material from the surrounding soils.

bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders or organic matter. A high water table affects the amount of usable material. It also affects trafficability.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock or to other layers that affect the rate of water movement, permeability, depth to a high water table or depth of standing water if the soil is subject to ponding, slope, susceptibility to flooding, subsidence of organic layers, and the potential for frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity in the root zone. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to

supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock. The performance of a system is affected by the depth of the root zone and by soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to control erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of soil blowing or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock affect the construction of grassed waterways. A hazard of soil blowing, low available water capacity, restricted rooting depth, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics. These results are reported in table 20.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classification, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering Index Properties

Table 17 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under the heading "Soil Series and Their Morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter (fig. 15). "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as about 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

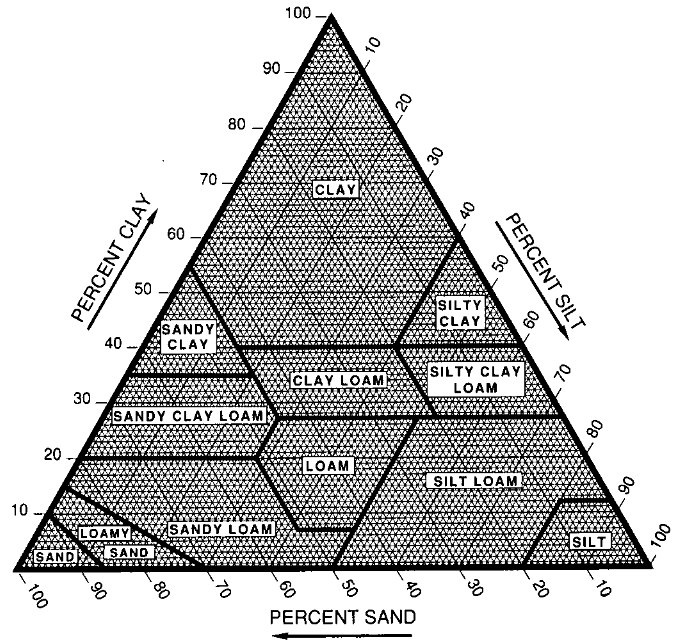

Figure 15.—Percentages of clay, silt, and sand in the basic USDA soil textural classes.

Classification of the soils is determined according to the Unified soil classification system (ASTM, 1993) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 1986).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils

exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest. The AASHTO classification for soils tested, with group index numbers in parentheses, is given in table 20.

Rock fragments larger than 10 inches in diameter and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are commonly rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

Table 18 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at $^1/_3$-bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of

irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; *high*, more than 6 percent; and *very high*, greater than 9 percent.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.02 to 0.64. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to soil blowing in cultivated areas. The groups indicate the susceptibility to soil blowing. The soils assigned to group 1 are the most susceptible to soil blowing, and those assigned to group 8 are the least susceptible. The groups are as follows:

1. Coarse sands, sands, fine sands, and very fine sands.

2. Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, ash material, and sapric soil material.

3. Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams.

4L. Calcareous loams, silt loams, clay loams, and silty clay loams.

4. Clays, silty clays, noncalcareous clay loams, and silty clay loams that are more than 35 percent clay.

5. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material.

6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay.

7. Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material.

8. Soils that are not subject to soil blowing because of coarse fragments on the surface or because of surface wetness.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 18, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Table 19 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist

mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to two hydrologic groups in table 19, the first letter is for drained areas and the second is for undrained areas.

Flooding, the temporary inundation of an area, is caused by overflowing streams or by runoff from adjacent slopes. Water standing for short periods after rainfall or snowmelt is not considered flooding, and water standing in swamps and marshes is considered ponding rather than flooding.

Table 19 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions (the chance of flooding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs, on the average, once or less in 2 years (the chance of flooding is 5 to 50 percent in any year); and *frequent* that it occurs, on the average, more than once in 2 years (the chance of flooding is more than 50 percent in any year). Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, *long* if 7 days to 1 month, and *very long* if more than 1 month. Probable dates are expressed in months. About two-thirds to three-fourths of all flooding occurs during the stated period.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The estimates are based mainly on observations of the water table at selected sites and on the evidence of a saturated zone, namely grayish colors or mottles (redoximorphic features) in the soil. Indicated in table 19 are the depth to the seasonal high water table; the kind of water table—that is, perched or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 19.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Two numbers in the column showing depth to the water table indicate the normal range in depth to a saturated zone. Depth is given to the nearest half foot. The first numeral in the range indicates the highest water level. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. "More than 6.0" indicates that the water table is below a depth of 6 feet or that it is within a depth of 6 feet for less than a month.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Subsidence is the settlement of organic soils or of saturated mineral soils of very low density. Subsidence generally results from either desiccation and shrinkage or oxidation of organic material, or both, following drainage. Subsidence takes place gradually, usually over a period of

several years. Table 19 shows the expected total subsidence, which usually is a result of drainage and oxidation.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low, moderate,* or *high,* is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low, moderate,* or *high.* It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Engineering Index Test Data

Table 20 shows laboratory test data for several pedons sampled at carefully selected sites in the survey area. The pedons are representative of the series described in the section "Soil Series and Their Morphology." The soil samples were tested by the Wisconsin Department of Transportation, Division of Highways and Transportation Facilities.

The testing methods generally are those of the American Association of State Highway and Transportation Officials (AASHTO) or the American Society for Testing and Materials (ASTM).

The tests and methods are AASHTO classification—M 145 (AASHTO), D 3282 (ASTM); Unified classification—D 2487 (ASTM); Mechanical analysis—T 88 (AASHTO), D 422 (ASTM), D 2217 (ASTM); Liquid limit—T 89 (AASHTO), D 4318 (ASTM); and Plasticity index—T 90 (AASHTO), D 4318 (ASTM).

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (USDA, 1975). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 21 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Eleven soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol.* An example is Entisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Psamment (*Psamm*, meaning sand, plus *ent*, from Entisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; type of saturation; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Quartzipsamments (*Quartzi*, meaning a high content of quartz, plus *psamment*, the suborder of the Entisols that are sandy).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic subgroup is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other taxonomic class. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Quartzipsamments.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle size, mineral content, soil temperature regime, soil depth, and reaction. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is mesic, coated Typic Quartzipsamments.

SERIES. The series consists of soils within a family that have horizons similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. Characteristics of the soil and the material in which it formed are identified for each series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the "Soil Survey Manual" (USDA, 1993). Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" (USDA, 1975). Unless otherwise indicated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed Soil Map Units."

Absco Series

The Absco series consists of very deep, moderately well drained, rapidly permeable soils on flood plains along rivers and large streams. These soils formed in siliceous, dominantly sandy alluvium. Slopes range from 0 to 3 percent.

Typical pedon of Absco loamy sand, 0 to 3 percent slopes, approximately 300 feet north and 1,280 feet east of the southwest corner of sec. 33, T. 20 N., R. 5 W.

A—0 to 4 inches; dark brown (10YR 3/3) loamy sand, pale brown (10YR 6/3) dry; weak fine granular structure; very friable; many very fine and fine roots; very strongly acid; abrupt wavy boundary.

Bw—4 to 14 inches; brown (10YR 4/3) sand; weak coarse subangular blocky structure; very friable; common very fine and fine roots; strongly acid; clear wavy boundary.

C1—14 to 35 inches; pale brown (10YR 6/3) sand; single grain; loose; few very fine and fine roots; thin strata of very dark grayish brown (10YR 3/2) fine sandy loam with a combined thickness of about 4 inches; strongly acid; gradual wavy boundary.

C2—35 to 42 inches; pale brown (10YR 6/3) loamy sand; single grain; loose; few very fine and fine roots; few medium prominent strong brown (7.5YR 5/8) masses of iron accumulation; thin strata of very dark grayish brown (10YR 3/2) silt loam and fine sandy loam with a combined thickness of about 2 inches; strongly acid; gradual wavy boundary.

C3—42 to 60 inches; very pale brown (10YR 7/3) sand; single grain; loose; common medium prominent strong brown (7.5YR 5/8) masses of iron accumulation; strongly acid.

The volume of gravel ranges from 0 to 10 percent throughout the pedon. The A horizon has value of 3 or 4 and chroma of 1 to 3. The Bw horizon has value of 4 or 5 and chroma of 3 to 6. It is sand or loamy sand. Some pedons do not have a Bw horizon. The C horizon has value of 4 to 7 and chroma of 2 to 6.

Adder Series

The Adder series consists of very deep, very poorly drained soils on backswamps of flood plains. These soils formed in organic material overlying siliceous sandy alluvium. Permeability is moderately slow to moderately rapid in the organic layers and rapid or very rapid in the sandy alluvium. Slopes are 0 to 1 percent.

Typical pedon of Adder muck, 0 to 1 percent slopes, approximately 900 feet south and 150 feet west of the northeast corner of sec. 11, T. 24 N., R. 6 W.

Oa—0 to 22 inches; muck (sapric material), black (N 2/0) broken face and rubbed; about 30 percent fiber, 5 percent rubbed; moderate medium subangular blocky structure; slightly sticky; many fine roots; primarily herbaceous fibers; strongly acid; abrupt smooth boundary.

C—22 to 60 inches; light brownish gray (10YR 6/2) sand; single grain; loose; slightly acid.

The thickness of the organic material ranges from 16 to 51 inches and coincides with the depth to sand. The Oa horizon has hue of 7.5YR or 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 2. It is dominantly muck, but some pedons have thin layers of mucky peat. The C horizon has hue of 7.5YR or 10YR, value of 4 to 7, and chroma of 1 to 3. It is sand, coarse sand, or fine sand.

Arbutus Series

The Arbutus series consists of excessively drained soils on strath terraces. These soils are moderately deep to igneous or metamorphic bedrock. They formed in siliceous sandy alluvium overlying igneous or metamorphic bedrock. Permeability is rapid in the sandy subsoil and substratum and ranges from rapid to very slow in the underlying igneous bedrock. Slopes range from 2 to 6 percent.

Typical pedon of Arbutus loamy sand, in an area of Ironrun-Ponycreek-Arbutus complex, 0 to 6 percent slopes, approximately 500 feet east and 600 feet south of the northwest corner of sec. 3, T. 22 N., R. 2 W.

Oe—0 to 1 inch; very dark grayish brown (10YR 3/2) mucky peat (hemic material, which is a mat of partially decomposed leaf and grass litter); weak very thin platy structure; nonsticky; few light gray (10YR 7/2) uncoated sand grains; very strongly acid; abrupt irregular boundary.

A—1 to 3 inches; very dark grayish brown (10YR 3/2) loamy sand, grayish brown (10YR 5/2) dry; weak medium granular structure; very friable; many very fine and fine roots; many uncoated light gray (10YR 7/2) sand grains; very strongly acid; abrupt smooth boundary.

E—3 to 6 inches; grayish brown (10YR 5/2) loamy sand, light brownish gray (10YR 6/2) dry; weak fine subangular blocky structure; very friable; many very fine and fine roots; very strongly acid; clear wavy boundary.

Bs—6 to 17 inches; dark brown (7.5YR 4/4) sand; weak fine subangular blocky structure; very friable; many very fine and fine roots; very strongly acid; clear wavy boundary.

Bw1—17 to 23 inches; brown (7.5YR 5/4) sand;

single grain; loose; few very fine and fine roots; moderately acid; abrupt smooth boundary.

Bw2—23 to 32 inches; yellowish brown (10YR 5/6) sand; single grain; loose; few very fine roots; moderately acid; abrupt smooth boundary.

R—32 inches; igneous bedrock.

Unless otherwise stated, depth and thickness in this paragraph are measured from the top of the mineral soil. The depth to bedrock ranges from 20 to 40 inches. The volume of gravel ranges from 0 to 10 percent throughout the profile. The volume of cobbles ranges from 0 to 3 percent.

The O horizon has hue of 7.5YR or 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 2. The A horizon has hue of 7.5YR or 10YR, value of 2 or 3, and chroma of 1 to 3. The E horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 2 or 3. It is loamy sand or sand. The Bs horizon has hue of 5YR or 7.5YR, value of 3 to 5, and chroma of 4. It is sand or loamy sand. The Bw or BC horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6. It is sand or loamy sand. The R layer is igneous or metamorphic bedrock.

Arenzville Series

The Arenzville series consists of very deep, moderately well drained, moderately permeable soils in intermittent upland drainageways and on flood plains along small perennial streams. These soils formed in silty alluvium overlying a buried soil with a dark colored A horizon. Slopes range from 0 to 3 percent.

Typical pedon of Arenzville silt loam, 0 to 3 percent slopes, approximately 500 feet north and 800 feet west of the southeast corner of sec. 14, T. 19 N., R. 6 W.

Ap—0 to 9 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak coarse subangular blocky structure; friable; many fine and very fine roots; neutral; abrupt smooth boundary.

C—9 to 32 inches; stratified dark brown (10YR 4/3 and 3/3) and brown (10YR 5/3) silt loam; massive but breaks to medium and thick plates along depositional strata; friable; common very fine and fine roots; neutral; clear smooth boundary.

Ab—32 to 42 inches; very dark brown (10YR 2/2) silt loam; weak thick and medium platy structure; friable; few very fine and fine roots; slightly acid; abrupt smooth boundary.

Cg—42 to 60 inches; light brownish gray (10YR 6/2) silt loam with a few thin lenses of fine sand; massive but breaks to very thick plates along depositional strata; friable; many medium prominent yellowish red (5YR 4/6) masses of iron accumulation; moderately acid.

The depth to the Ab horizon ranges from 20 to 60 inches. The Ap or A horizon has value of 3 or 4 and chroma of 2 or 3. The C horizon has value of 3 to 5 and chroma of 2 to 4. The Ab horizon has value of 2 or 3 and chroma of 1 or 2. The Cg or C′ horizon has value of 3 to 6 and chroma of 2 to 4. In some pedons the Cg or C′ horizon does not have thin lenses of fine sand.

Bertrand Series

The Bertrand series consists of very deep, well drained soils on stream terraces and pediments. These soils formed dominantly in silty alluvium overlying sandy alluvium. Permeability is moderate in the silty alluvium and rapid in the sandy alluvium. Slopes range from 1 to 6 percent.

Typical pedon of Bertrand silt loam, 1 to 6 percent slopes, approximately 2,300 feet north and 2,300 feet east of the southwest corner of sec. 4, T. 20 N., R. 5 W.

Ap—0 to 9 inches; dark brown (10YR 3/3) silt loam, pale brown (10YR 6/3) dry; weak fine subangular blocky structure; friable; few very fine and fine roots; slightly acid; abrupt smooth boundary.

Bt1—9 to 14 inches; dark yellowish brown (10YR 4/4) silt loam; weak fine subangular blocky structure; friable; few very fine and fine roots; few distinct dark brown (7.5YR 4/4) clay films on faces of peds; slightly acid; clear wavy boundary.

Bt2—14 to 24 inches; dark yellowish brown (10YR 4/4) silt loam; weak medium subangular blocky structure; friable; few very fine and fine roots; few distinct dark brown (7.5YR 4/4) clay films on faces of peds; moderately acid; clear wavy boundary.

Bt3—24 to 43 inches; dark brown (7.5YR 4/4) and brown (7.5YR 5/4) silt loam; moderate medium subangular blocky structure; friable; few very fine roots; common faint dark brown (7.5YR 3/4) clay films on faces of peds; strongly acid; clear wavy boundary.

2Bt4—43 to 48 inches; dark brown (7.5YR 4/4) fine sandy loam; weak coarse subangular blocky structure; friable; few very fine roots; few faint dark brown (7.5YR 3/4) clay films on faces of peds; strongly acid; gradual wavy boundary.

3C—48 to 60 inches; yellow (10YR 7/6) sand; single grain; loose; thin strata of strong brown (7.5YR 5/6) loamy fine sand; moderately acid.

The thickness of the silty mantle and the depth to the sandy substratum range from 40 to 60 inches. The Ap horizon has value of 3 or 4 and chroma of 2 or 3. The Bt and 2Bt horizons have value of 4 or 5 and chroma of 3 or 4. The Bt horizon is silt loam or silty clay loam. The 2Bt horizon is fine sandy loam, sandy loam, or loam. The 3C horizon has hue of 7.5YR or 10YR, value of 4 to 8, and chroma of 2 to 8. It is sand, fine sand, or loamy sand.

Bilmod Series

The Bilmod series consists of very deep, moderately well drained soils on stream terraces and pediments. These soils formed mostly in siliceous loamy alluvium underlain by siliceous sandy alluvium. Permeability is moderate or moderately rapid in the loamy alluvium and rapid in the sandy alluvium. Slopes range from 0 to 3 percent.

Typical pedon of Bilmod sandy loam, 0 to 3 percent slopes, approximately 1,020 feet south and 240 feet east of the northwest corner of sec. 27, T. 24 N., R. 6 W.

Ap—0 to 9 inches; dark brown (7.5YR 3/2) sandy loam, brown (7.5YR 5/2) dry; weak coarse subangular blocky structure; friable; many very fine and fine and few medium roots; neutral; abrupt wavy boundary.

Bt1—9 to 15 inches; dark brown (7.5YR 4/4) sandy loam; moderate medium subangular blocky structure; friable; many very fine and fine and few medium roots; common faint dark brown (7.5YR 3/4) clay films on faces of peds; slightly acid; clear wavy boundary.

Bt2—15 to 24 inches; dark brown (7.5YR 4/4) loam; moderate medium subangular blocky structure; friable; common very fine and fine roots; common faint dark brown (7.5YR 3/4) clay films on faces of peds; slightly acid; clear irregular boundary.

BC—24 to 32 inches; strong brown (7.5YR 5/6) loamy sand; weak coarse subangular blocky structure; very friable; few very fine roots; moderately acid; gradual wavy boundary.

2C—32 to 60 inches; reddish yellow (7.5YR 7/6) sand; single grain; loose; common faint strong brown (7.5YR 5/6) and common distinct strong brown (7.5YR 5/8) masses of iron accumulation; moderately acid.

The thickness of the loamy mantle and the depth to siliceous sandy alluvium range from 20 to 40 inches. The Ap or A horizon has hue of 7.5YR or 10YR, value of 2 or 3, and chroma of 1 to 3. The Bt horizon has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 4. It is sandy loam, fine sandy loam, or loam. The 2BC or 2Bt horizon has hue of 7.5YR or 10YR and value and chroma of 4 to 6. It is loamy sand or sand. The 2C horizon has hue of 7.5YR or 10YR, value of 5 to 8, and chroma of 3 to 8. It has thin strata of loamy sand or sandy loam in some pedons. The volume of sandstone channers ranges from 0 to 15 percent in the 2C horizon.

Bilson Series

The Bilson series consists of very deep, well drained soils on stream terraces and pediments. These soils formed in siliceous loamy alluvium overlying siliceous sandy alluvium. Permeability is moderate or moderately rapid in the loamy alluvium and rapid in the sandy alluvium. Slopes range from 0 to 20 percent.

Typical pedon of Bilson sandy loam, 0 to 6 percent slopes, approximately 1,200 feet north and 120 feet west of the southeast corner of sec. 17, T. 22 N., R. 4 W.

Ap—0 to 8 inches; very dark brown (10YR 2/2) sandy loam, grayish brown (10YR 5/2) dry; weak fine granular structure; friable; many very fine and fine and few medium roots; slightly acid; abrupt smooth boundary.

Bt1—8 to 12 inches; dark yellowish brown (10YR 4/4) sandy loam; moderate medium subangular blocky structure; friable; few very fine roots; few distinct dark brown (7.5YR 4/4) and prominent dark reddish brown (5YR 3/2) clay films on faces of peds; slightly acid; clear wavy boundary.

Bt2—12 to 18 inches; dark brown (7.5YR 4/4) sandy loam; moderate medium subangular blocky structure; friable; few very fine roots; common faint dark brown (7.5YR 3/4) and few distinct reddish brown (5YR 4/4) clay films on faces of peds; slightly acid; clear wavy boundary.

Bt3—18 to 32 inches; dark brown (7.5YR 4/4) and strong brown (7.5YR 5/6) sandy loam; weak coarse subangular blocky structure; friable; few very fine roots; common faint dark brown (7.5YR 3/4) and few distinct reddish brown (5YR 4/4) clay films on faces of peds; strongly acid; clear wavy boundary.

2C—32 to 60 inches; brownish yellow (10YR 6/6)

sand; single grain; loose; few thin (1/8 inch thick) strata of dark brown (7.5YR 4/4) loamy sand; strongly acid.

The thickness of the loamy mantle and the depth to siliceous sandy alluvium range from 20 to 40 inches. The Ap or A horizon has hue of 7.5YR or 10YR, value of 2 or 3, and chroma of 1 to 3. The Bt horizon has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 4. It is sandy loam, fine sandy loam, or loam. Some pedons have a 2Bt or 2BC horizon. This horizon has hue of 7.5YR or 10YR and value and chroma of 4 to 6. It is loamy sand or sand. The 2C horizon has hue of 7.5YR or 10YR, value of 5 to 8, and chroma of 3 to 8. It contains thin strata of sandy loam in some pedons. The volume of sandstone channers in the 2C horizon ranges from 0 to 15 percent.

Boone Series

The Boone series consists of excessively drained soils that are moderately deep to sandstone bedrock on bedrock-controlled uplands. These soils formed in siliceous sandy residuum derived from the underlying sandstone. Permeability is rapid in the sandy residuum and moderately slow or moderate in the underlying sandstone. Slopes range from 2 to 50 percent.

Typical pedon of Boone sand, in an area of Boone-Elevasil complex, 15 to 50 percent slopes, approximately 1,640 feet north and 2,040 feet west of the southeast corner of sec. 24, T. 19 N., R. 6 W.

Oe—0 to 1 inch; dark grayish brown (10YR 4/2) mucky peat (hemic material, which is a mat of partially decomposed forest litter); weak thin platy structure; nonsticky; very strongly acid; abrupt smooth boundary.

A—1 to 3 inches; very dark grayish brown (10YR 3/2) sand, dark grayish brown (10YR 4/2) dry; weak fine granular structure; very friable; many very fine and fine roots; pale brown (10YR 6/3), uncoated sand grains throughout; strongly acid; abrupt wavy boundary.

E—3 to 8 inches; brown (10YR 4/3) sand, pale brown (10YR 6/3) dry; weak medium subangular blocky structure; very friable; common very fine and fine roots; about 14 percent sandstone channers; strongly acid; abrupt wavy boundary.

Bw—8 to 21 inches; dark yellowish brown (10YR 4/4) sand; weak coarse subangular blocky structure; very friable; few fine roots; about 13 percent sandstone channers; strongly acid; clear wavy boundary.

C—21 to 35 inches; brownish yellow (10YR 6/6) sand; single grain; loose; few fine roots; about 10 percent sandstone channers; strongly acid; gradual smooth boundary.

Cr—35 to 61 inches; white (10YR 8/2) sandstone.

Unless otherwise stated, thickness and depth in this paragraph are measured from the top of the mineral soil. The thickness of the solum and the depth to sandstone range from 20 to 40 inches. The volume of sandstone channers averages less than 15 percent in the sandy mantle but ranges to 35 percent in individual subhorizons.

The O horizon has hue of 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 1 or 2. The A horizon has value of 2 or 3 and chroma of 1 to 3. The E horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 2 or 3. It is sand, fine sand, loamy sand, or loamy fine sand. Some pedons do not have an E horizon. The Bw horizon has hue of 7.5YR or 10YR, value of 3 to 6, and chroma of 4 to 6. It is typically sand or fine sand, but in some pedons it is loamy sand or loamy fine sand in the upper part. The C horizon has hue of 7.5YR or 10YR, value of 4 to 8, and chroma of 1 to 6. It is sand or fine sand or the channery analogs of these textures.

Citypoint Series

The Citypoint series consists of very poorly drained soils on pediments. These soils are moderately deep or deep to interbedded sandstone and shale bedrock. They formed in organic material overlying interbedded sandstone and shale. Permeability is moderately slow to moderately rapid in the organic layers, slow to rapid in the residuum, and extremely slow to moderately slow in the underlying interbedded sandstone and shale. Slopes are 0 to 1 percent.

Typical pedon of Citypoint mucky peat, 0 to 1 percent slopes, approximately 300 feet north and 300 feet east of the center of sec. 9, T. 22 N., R. 1 E.

Oe—0 to 12 inches; mucky peat, dark reddish brown (5YR 3/2) broken face and rubbed; about 60 percent fiber, 20 percent rubbed; nonsticky; many very fine to medium roots; primarily herbaceous fibers; extremely acid (pH 4.4 by the Truog method); clear wavy boundary.

Oa1—12 to 22 inches; muck, dark reddish brown (5YR 2.5/2) broken face and rubbed; about 35 percent fiber, 10 percent rubbed; slightly sticky; few very fine and fine roots; primarily herbaceous fibers; extremely acid (pH 4.4 by the Truog method); abrupt wavy boundary.

Oa2—22 to 26 inches; muck, black (N 2/0) broken face and rubbed; less than 10 percent fiber, less than 5 percent rubbed; slightly sticky; primarily herbaceous fibers; extremely acid (pH 4.4 by the Truog method); gradual wavy boundary.

Cg—26 to 34 inches; light brownish gray (10YR 6/2) fine sand; single grain; loose; slightly acid.

Cr—34 to 60 inches; greenish gray (5G 5/1) and olive yellow (2.5Y 6/8), interbedded sandstone and shale.

The thickness of the organic material ranges from 16 to 51 inches and coincides with the depth to the C horizon. Depth to the Cr horizon ranges from 20 to 51 inches. Below the surface layer the organic layers are dominantly muck (sapric material), but thin layers of mucky peat (hemic material) or peat (fibric material) are in some pedons. The mucky peat has hue of 5YR or 7.5YR, value of 2 to 4, and chroma of 2 or 3. The muck has hue of 5YR, 7.5YR, or 10YR or is neutral in hue. It has value of 2 to 4 and chroma of 0 to 2. Some pedons have thin layers of peat that has colors similar to those of the mucky peat. The texture of the C horizon ranges from sand to silty clay. The C horizon has hue of 2.5YR, 5YR, 7.5YR, 10YR, 2.5Y, 5Y, 5GY, or 5G, value of 4 to 7, and chroma of 1 to 4. The Cr horizon has hue of 2.5YR, 5YR, 7.5YR, 10YR, 2.5Y, 5Y, 5GY, or 5G, value of 3 to 7, and chroma of 1 to 4. It consists of interbedded sandstone and shale.

Coffton Series

The Coffton series consists of very deep, somewhat poorly drained soils on flood plains and alluvial fans. These soils formed in silty alluvium. Permeability is moderate. Slopes range from 0 to 3 percent.

Typical pedon of Coffton silt loam, 0 to 3 percent slopes, approximately 1,440 feet south and 500 feet west of the center of sec. 15, T. 19 N., R. 6 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, brown (10YR 5/3) dry; moderate medium granular structure; friable; common very fine and fine roots; neutral; abrupt smooth boundary.

A—8 to 11 inches; very dark gray (10YR 3/1) silt loam, dark gray (10YR 4/1) dry; weak coarse subangular blocky structure parting to weak medium platy; friable; common very fine and fine roots; neutral; clear smooth boundary.

Bg1—11 to 23 inches; dark grayish brown (10YR 4/2) silt loam; weak medium subangular blocky structure; friable; common very fine and fine roots; few faint grayish brown (10YR 5/2) coatings of silt and fine sand on faces of peds; common fine prominent strong brown (7.5YR 5/8) masses of iron accumulation; neutral; clear wavy boundary.

Bg2—23 to 38 inches; grayish brown (10YR 5/2) silt loam; weak medium subangular blocky structure; friable; common very fine and fine roots; common distinct light brownish gray (2.5Y 6/2) silt coatings and few faint dark gray (10YR 4/1) organic coatings on faces of peds; many fine prominent strong brown (7.5YR 5/8) masses of iron accumulation; neutral; gradual smooth boundary.

Cg—38 to 60 inches; olive gray (5Y 5/2) silt loam; massive; friable; few thin strata of dark grayish brown (10YR 4/2) fine sandy loam; many fine prominent yellowish red (5YR 4/6) masses of iron accumulation; many prominent black (N 2/0) iron-manganese concretions; neutral.

The thickness of the solum ranges from 30 to 50 inches. The Ap or A horizon has value of 2 or 3 and chroma of 1 to 3. The Bg horizon has hue of 10YR or 2.5Y and value of 4 to 6. Some pedons have a thin Bw horizon, which has chroma of 3. The Cg horizon has hue of 10YR to 5Y, value of 4 to 6, and chroma of 1 or 2. It is silt loam, or it is silt loam that has strata of loam, fine sandy loam, loamy fine sand, or fine sand.

Council Series

The Council series consists of very deep, well drained soils on bedrock-controlled uplands (fig. 16). These soils formed mostly in loamy colluvium. Permeability is moderate. Slopes range from 6 to 35 percent.

Typical pedon of Council loam, in an area of Council and Seaton soils, 12 to 20 percent slopes, eroded, about 1,900 feet west and 200 feet north of the southeast corner of sec. 5, T. 19 N., R. 6 W.

Ap—0 to 7 inches; dark brown (10YR 3/3) loam, pale brown (10YR 6/3) dry; weak coarse subangular blocky structure; common fragments of dark yellowish brown (10YR 4/4) subsoil material; friable; many fine and medium roots; moderately acid; abrupt smooth boundary.

Bt1—7 to 13 inches; dark yellowish brown (10YR 4/4) loam; moderate fine subangular blocky structure; friable; common very fine and fine roots; few distinct dark brown (7.5YR 4/4) clay films on faces of peds; few dark brown (10YR 4/3) silt coatings on faces of peds; strongly acid; clear wavy boundary.

Bt2—13 to 27 inches; dark yellowish brown (10YR 4/4) loam; moderate medium subangular blocky structure; friable; common very fine and fine roots; many distinct dark brown (7.5YR 4/4) clay films on faces of peds; strongly acid; clear wavy boundary.

Bt3—27 to 35 inches; dark yellowish brown (10YR 4/4) loam; moderate coarse subangular blocky structure; friable; few very fine and fine roots; common distinct dark brown (7.5YR 4/4) clay films on faces of peds; strongly acid; clear wavy boundary.

Bt4—35 to 45 inches; dark yellowish brown (10YR 4/4) sandy loam; weak very coarse subangular blocky structure; friable; few very fine and fine roots; few distinct dark brown (7.5YR 4/4) clay films on faces of peds; strongly acid; abrupt irregular boundary.

C—45 to 60 inches; light yellowish brown (10YR 6/4) and dark yellowish brown (10YR 4/4) silt loam with pockets or layers of loam; massive; friable; common medium distinct brownish yellow (10YR 6/8) relict masses of iron accumulation and common fine distinct grayish brown (10YR 5/2) relict masses of iron depletion; about 5 percent sandstone channers; moderately acid.

Depth to the base of the argillic horizon ranges from 36 to more than 80 inches. The volume of sandstone channers or chert gravel ranges from 0 to 15 percent throughout the profile. The Ap horizon has value of 3 or 4 and chroma of 2 to 4. The A horizon, if it occurs, has value of 2 or 3 and chroma of 1 or 2. The Ap or A horizon is fine sandy loam or loam. The Bt and C horizons have hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 3 to 8. The Bt horizon is loam, silt loam, sandy loam, or fine sandy loam. The C horizon is loam, fine sandy loam, sandy loam, or silt loam or has pockets or layers with these textures.

Dawsil Series

The Dawsil series consists of very deep, very poorly drained soils on pediments and stream terraces. These soils formed in organic material overlying siliceous sandy alluvium. Permeability is moderately slow to moderately rapid in the organic layers and rapid in the sandy alluvium. Slopes are 0 to 1 percent.

Typical pedon of Dawsil mucky peat, 0 to 1 percent slopes, approximately 800 feet south and 500 feet west of the northeast corner of sec. 35, T. 20 N., R. 1 E.

Oe1—0 to 8 inches; mucky peat (hemic material), dark reddish brown (5YR 3/2) broken face and rubbed; about 80 percent fiber, 25 percent rubbed; nonsticky; many very fine to medium roots; primarily herbaceous fibers; extremely acid (pH 4.4 by the Truog method); clear wavy boundary.

Oe2—8 to 20 inches; mucky peat (hemic material), dark brown (7.5YR 3/2) broken face and rubbed; about 70 percent fiber, 20 percent rubbed; nonsticky; few very fine and fine roots; primarily herbaceous fibers; extremely acid (pH 4.4 by the Truog method); abrupt wavy boundary.

Oa—20 to 40 inches; muck (sapric material), black (10YR 2/1) broken face and rubbed; about 30 percent fiber, 5 percent rubbed; weak coarse subangular blocky structure; slightly sticky; primarily herbaceous fibers; extremely acid (pH 4.4 by the Truog method); gradual wavy boundary.

C—40 to 60 inches; light brownish gray (10YR 6/2) sand; single grain; loose; slightly acid.

The thickness of the organic material and the depth to sandy alluvium range from 16 to 51 inches. The mucky peat has hue of 5YR or 7.5YR, value of 2 to 4, and chroma of 2 or 3. The muck has hue of 7.5YR or 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 2. Some pedons have thin layers of peat that has colors similar to those of the mucky peat. The C horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 1 to 4. The volume of gravel and sandstone channers ranges from 0 to 15 percent in the C horizon. The C horizon is sand, coarse sand, or loamy sand.

Dunnville Series

The Dunnville series consists of very deep, well drained soils on low stream terraces. These soils formed in loamy alluvium overlying sandy alluvium. Permeability is moderate or moderately rapid in the loamy alluvium and rapid or very rapid in the sandy alluvium. Slopes range from 0 to 3 percent.

Typical pedon of Dunnville sandy loam, 0 to 3 percent slopes, approximately 2,500 feet south and 400 feet east of the northwest corner of sec. 31, T. 20 N., R. 4 W.

Ap—0 to 9 inches; dark reddish brown (5YR 2.5/2) sandy loam, dark brown (7.5YR 4/2) dry; weak medium granular structure; friable; many very fine to medium roots; strongly acid; clear wavy boundary.

A1—9 to 12 inches; dark reddish brown (5YR 2.5/2) sandy loam, dark brown (10YR 4/2) dry; weak

medium subangular blocky structure; friable; many very fine to medium roots; strongly acid; gradual wavy boundary.

A2—12 to 16 inches; dark reddish brown (5YR 3/2) sandy loam, brown (10YR 4/3) dry; weak medium subangular blocky structure; friable; many very fine to medium roots; strongly acid; clear wavy boundary.

Bw—16 to 24 inches; dark reddish brown (5YR 3/4) sandy loam; moderate medium subangular blocky structure; friable; common very fine to medium roots; very strongly acid; clear wavy boundary.

2BC—24 to 27 inches; reddish brown (5YR 5/4) loamy sand; weak medium subangular blocky structure; very friable; few very fine and fine roots; very strongly acid; abrupt wavy boundary.

2C—27 to 60 inches; reddish yellow (7.5YR 6/6) sand; single grain; loose; moderately acid.

The thickness of the loamy alluvium and the depth to sandy alluvium range from 20 to 40 inches. The A horizon has hue of 5YR, 7.5YR, or 10YR and value and chroma of 2 or 3. The Bw horizon has hue of 2.5YR, 5YR, or 7.5YR and value and chroma of 3 or 4. It is sandy loam, fine sandy loam, or loam. The 2BC horizon has hue of 5YR, 7.5YR, or 10YR and value and chroma of 4 to 6. It is loamy sand or loamy coarse sand. The 2C horizon has hue of 5YR, 7.5YR, or 10YR, value of 6 to 8, and chroma of 4 to 8. It is sand, coarse sand, fine sand, or the gravelly analogs of these textures. The volume of gravel ranges from 0 to 35 percent in the 2C horizon.

Elevasil Series

The Elevasil series consists of well drained soils on pediments and bedrock-controlled uplands. These soils are moderately deep to sandstone bedrock. They formed mostly in siliceous loamy colluvium and siliceous sandy residuum derived from the underlying sandstone. Permeability is moderate or moderately rapid in the loamy colluvium, rapid in the sandy residuum, and moderately slow or moderate in the underlying sandstone. Slopes range from 2 to 30 percent.

Typical pedon of Elevasil sandy loam, in an area of Boone-Elevasil complex, 15 to 50 percent slopes, approximately 1,000 feet east and 1,300 feet south of the northwest corner of sec. 30, T. 19 N., R. 6 W.

Oe—0 to 1 inch; very dark grayish brown (10YR 3/2) mucky peat (hemic material, which is a mat of partially decomposed forest litter); about 50 percent fiber, 25 percent rubbed; weak thin platy structure; nonsticky; very strongly acid; abrupt smooth boundary.

A—1 to 3 inches; very dark brown (10YR 2/2) sandy loam, brown (10YR 5/3) dry; weak fine granular structure; very friable; many fine and medium roots; very strongly acid; abrupt wavy boundary.

Bt1—3 to 9 inches; dark yellowish brown (10YR 4/4) sandy loam; weak medium subangular blocky structure; friable; common fine and medium roots; few distinct dark brown (7.5YR 4/4) clay films on faces of peds; strongly acid; abrupt irregular boundary.

Bt2—9 to 27 inches; strong brown (7.5YR 5/6) sandy loam; moderate medium subangular blocky structure; friable; common very fine to medium roots; few distinct dark brown (7.5YR 4/4) clay films on faces of peds; about 5 percent sandstone channers in the lower part; very strongly acid; abrupt irregular boundary.

2BC—27 to 31 inches; strong brown (7.5YR 5/6) loamy sand; weak medium subangular blocky structure; very friable; few very fine roots; about 10 percent sandstone channers; very strongly acid; abrupt wavy boundary.

2C—31 to 39 inches; reddish yellow (7.5YR 6/6) sand; single grain; loose; about 14 percent sandstone channers; strongly acid; clear smooth boundary.

2Cr—39 to 60 inches; very pale brown (10YR 7/4) sandstone.

The thickness of the loamy mantle and the depth to sandstone range from 20 to 40 inches. The volume of sandstone channers ranges from 0 to 15 percent in the loamy colluvium and from 5 to 35 percent in the sandy residuum. The Ap or A horizon has value and chroma of 2 to 4. The E horizon, if it occurs, has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 2 or 3. The Bt horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 to 6. It is sandy loam, fine sandy loam, or loam. The 2BC and 2C horizons have hue of 7.5YR or 10YR, value of 5 to 7, and chroma of 2 to 6. The 2BC horizon is loamy sand, loamy fine sand, sand, or fine sand or the channery analogs of these textures. The 2C horizon has colors like those of the 2BC horizon. It is sand or fine sand or the channery analogs of these textures.

Elm Lake Series

The Elm Lake series consists of poorly drained soils on pediments. These soils are moderately deep to interbedded sandstone and shale bedrock. They formed dominantly in siliceous sandy alluvium

overlying loamy residuum derived from the underlying interbedded sandstone and shale. Permeability is rapid in the sandy alluvium, moderately slow or moderate in the loamy residuum, and extremely slow to moderately slow in the underlying interbedded sandstone and shale. Slopes range from 0 to 2 percent.

Typical pedon of Elm Lake muck, in an area of Fairchild-Elm Lake complex, 0 to 3 percent slopes, approximately 1,600 feet north and 105 feet west of the southeast corner of sec. 14, T. 23 N., R. 4 W.

Oa—0 to 4 inches; muck (sapric material), black (N 2/0) broken face and rubbed; about 50 percent fiber, 15 percent rubbed; moderate thick platy structure; nonsticky; many fine roots; extremely acid (pH 4.0 by the Truog method); abrupt smooth boundary.

A—4 to 8 inches; very dark gray (10YR 3/1) sand, gray (10YR 5/1) dry; weak medium subangular blocky structure; very friable; common fine roots; extremely acid; clear wavy boundary.

Cg1—8 to 15 inches; gray (10YR 5/1) sand; single grain; loose; strongly acid; clear wavy boundary.

Cg2—15 to 28 inches; grayish brown (10YR 5/2) loamy sand; single grain; loose; common medium prominent brownish yellow (10YR 6/8) masses of iron accumulation; strongly acid; clear wavy boundary.

2Cg3—28 to 38 inches; light brownish gray (10YR 6/2) clay loam; massive; firm; common medium prominent yellowish red (5YR 5/8) masses of iron accumulation; about 10 percent sandstone channers; very strongly acid; clear wavy boundary.

2Cr—38 to 60 inches; dark grayish brown (10YR 4/2) and light brownish gray (10YR 6/2), interbedded sandstone and shale.

The thickness of the siliceous sandy alluvium and the depth to loamy residuum range from 15 to 39 inches. The depth to interbedded sandstone and shale ranges from 20 to 40 inches. The Oa horizon has hue of 5YR, 7.5YR, or 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 2. The A horizon has value of 2 or 3 and chroma of 1 or 2. It is sand or mucky sand. The Cg horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 7, and chroma of 2 or 3. It is sand, fine sand, or loamy sand. The 2Cg horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 or 2. It is dominantly loam, sandy clay loam, clay loam, or silty clay loam; in some pedons, however, it has subhorizons of coarser or finer textures, which reflect the interbedding of the sandstone and shale. The volume of sandstone channers ranges from 0 to 15 percent in the 2Cg horizon.

Ettrick Series

The Ettrick series consists of very deep, poorly drained soils on flood plains. These soils formed in silty alluvium. Permeability is moderately slow in the subsoil and moderate or moderately slow in the substratum. Slopes range from 0 to 2 percent.

Typical pedon of Ettrick silt loam, 0 to 2 percent slopes, approximately 1,100 feet east and 1,000 feet south of the center of sec. 17, T. 23 N., R. 6 W.

A1—0 to 4 inches; very dark gray (10YR 3/1) silt loam, dark grayish brown (10YR 4/2) dry; weak medium platy structure; friable; many very fine roots; slightly acid; clear smooth boundary.

A2—4 to 15 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; weak medium platy structure; friable; common very fine roots; common medium prominent strong brown (7.5YR 5/6) masses of iron accumulation; slightly acid; clear wavy boundary.

Bg1—15 to 21 inches; gray (10YR 5/1) silt loam; weak very thick platy structure parting to weak medium subangular blocky; friable; few very fine and fine roots; common medium prominent strong brown (7.5YR 5/6 and 5/8) masses of iron accumulation; neutral; clear wavy boundary.

Bg2—21 to 28 inches; grayish brown (10YR 5/2) silt loam; weak medium subangular blocky structure; friable; few very fine and fine roots; common medium prominent strong brown (7.5YR 5/6) and yellowish red (5YR 4/6) masses of iron accumulation; neutral; clear wavy boundary.

Bg3—28 to 40 inches; grayish brown (10YR 5/2) silt loam; weak very coarse prismatic structure; friable; few very fine roots; many fine and medium prominent yellowish red (5YR 5/6) masses of iron accumulation; neutral; clear wavy boundary.

Cg1—40 to 46 inches; gray (10YR 6/1) silt loam; massive; friable; many coarse prominent yellowish red (5YR 4/6) masses of iron accumulation; neutral; clear wavy boundary.

Cg2—46 to 60 inches; gray (5Y 6/1) silt loam; massive; friable; many coarse prominent yellowish red (5YR 4/6) masses of iron accumulation; neutral.

The thickness of the solum ranges from 30 to 50 inches. The thickness of the mollic epipedon ranges from 10 to 18 inches. The A horizon has value of 2 or 3 and chroma of 1 or 2. The Bg and Cg horizons have

hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 or 2. The Bg horizon is silt loam or silty clay loam. The Cg horizon is silt loam, or it is silt loam that has thin strata of fine sand, loamy fine sand, fine sandy loam, or silt.

Fairchild Series

The Fairchild series consists of somewhat poorly drained soils on pediments. These soils are moderately deep to interbedded sandstone and shale bedrock. They formed in siliceous sandy alluvium and in loamy residuum derived from the underlying interbedded sandstone and shale. Permeability is rapid in the sandy alluvium, moderately slow or moderate in the loamy residuum, and extremely slow to moderately slow in the underlying interbedded sandstone and shale. Slopes range from 0 to 3 percent.

Typical pedon of Fairchild sand, in an area of Fairchild-Elm Lake complex, 0 to 3 percent slopes, approximately 1,400 feet south and 300 feet west of the northeast corner of sec. 35, T. 22 N., R. 3 W.

Oe—0 to 2 inches; very dark grayish brown (10YR 3/2) mucky peat (hemic material, which is a mat of partially decomposed leaf and grass litter); about 40 percent fiber, 25 percent rubbed; weak thin platy structure; nonsticky; very strongly acid; abrupt wavy boundary.

A—2 to 4 inches; black (10YR 2/1) sand, dark brown (7.5YR 3/2) dry; weak fine granular structure; very friable; common very fine and fine roots; very strongly acid; abrupt smooth boundary.

E—4 to 13 inches; grayish brown (10YR 5/2) sand, light gray (10YR 7/2) dry; weak medium subangular blocky structure; very friable; common very fine and fine roots; strongly acid; abrupt wavy boundary.

Bhs—13 to 16 inches; dark reddish brown (5YR 3/3) sand; weak medium subangular blocky structure; very friable; common very fine and fine roots; strongly acid; abrupt smooth boundary.

Bs—16 to 21 inches; dark brown (7.5YR 4/4) sand; weak coarse subangular blocky structure; very friable; few very fine and fine roots; few fine distinct strong brown (7.5YR 5/6) masses of iron accumulation; strongly acid; clear wavy boundary.

Bw—21 to 32 inches; brownish yellow (10YR 6/6) sand; weak coarse subangular blocky structure; very friable; few very fine and fine roots; common medium distinct brownish yellow (10YR 6/8) and common medium prominent yellowish red (5YR 5/8) masses of iron accumulation; strongly acid; abrupt wavy boundary.

2Bt—32 to 39 inches; pale olive (5Y 6/3) clay loam; weak coarse subangular blocky structure; firm; few very fine and fine roots; few faint olive gray (5Y 5/2) clay films on faces of peds; coarse prominent strong brown (7.5YR 5/8) masses of iron accumulation; about 10 percent sandstone channers; extremely acid; gradual wavy boundary.

2Cr—39 to 60 inches; light gray (5Y 7/2) and light olive gray (5Y 6/2), interbedded sandstone and shale.

Thickness and depth in this paragraph are measured from the top of the mineral soil. The thickness of the sandy alluvium over the residuum ranges from 15 to 39 inches. The thickness of the solum and the depth to interbedded sandstone and shale range from 20 to 40 inches.

The O horizon has hue of 7.5YR or 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 2. The A horizon has value of 2 or 3 and chroma of 1 or 2. The E horizon has hue of 7.5YR or 10YR and value of 5 or 6. It is sand or loamy sand. The Bhs horizon has hue of 5YR or 7.5YR, value of 2 or 3, and chroma of 1 to 3. It is sand or loamy sand. The Bs horizon has hue of 5YR or 7.5YR and value of 3 or 4. The Bw horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 3 to 6. The Bw and Bs horizons are sand or loamy sand. The 2Bt horizon has hue of 2.5YR, 5YR, 7.5YR, 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 2 to 4. It is dominantly clay loam, loam, or sandy clay loam; in some pedons, however, it has subhorizons of coarser or finer textures, which reflect the interbedding of the sandstone and shale. The volume of sandstone channers in the 2Bt horizon ranges from 3 to 15 percent.

Fordum Series

The Fordum series consists of very deep, poorly drained soils on flood plains. These soils formed in silty and loamy alluvium overlying sandy alluvium. Permeability is moderate or moderately rapid in the silty and loamy alluvium and rapid or very rapid in the underlying sandy alluvium. Slopes range from 0 to 2 percent.

Typical pedon of Fordum silt loam, in an area of Moppet-Fordum complex, 0 to 3 percent slopes, approximately 2,600 feet north and 400 feet west of the southeast corner of sec. 19, T. 22 N., R. 1 E.

A—0 to 6 inches; black (10YR 2/1) silt loam, dark grayish brown (10YR 4/2) dry; moderate medium

granular structure; very friable; many very fine and fine roots; very strongly acid; clear smooth boundary.

Cg1—6 to 12 inches; dark grayish brown (10YR 4/2) fine sandy loam; weak coarse subangular blocky structure; very friable; common very fine roots; common coarse prominent reddish brown (5YR 4/4) masses of iron accumulation; very strongly acid; gradual smooth boundary.

Cg2—12 to 35 inches; grayish brown (10YR 5/2) fine sandy loam; weak coarse subangular blocky structure; very friable; few very fine roots; many coarse prominent yellowish red (5YR 5/6) masses of iron accumulation; common thin strata of brown (10YR 5/3) sand; very strongly acid; clear wavy boundary.

Cg3—35 to 60 inches; dark grayish brown (10YR 4/2) sand; single grain; loose; common thin strata of dark gray (10YR 4/1) fine sandy loam; strongly acid.

The thickness of silty and loamy alluvium and the depth to sandy alluvium range from 24 to 40 inches. The A horizon has hue of 7.5YR or 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 3. The Cg horizons that formed in loamy alluvium have hue of 2.5YR, 7.5YR, or 10YR, value of 3 to 5, and chroma of 1 or 2. They are silt loam and are commonly stratified with loam, sandy loam, or fine sandy loam or the gravelly analogs of these textures. Thin strata of sand or fine sand are commonly in the loamy alluvium. The 2Cg or 2C3 horizon that formed in sandy alluvium has hue of 5YR, 7.5YR, or 10YR, value of 2 to 5, and chroma of 1 to 4. It is sand, fine sand, loamy sand, or loamy fine sand or the gravelly analogs of these textures and has thin strata of fine sandy loam or loam. The volume of gravel ranges from 0 to 30 percent in the sandy alluvium.

Gale Series

The Gale series consists of well drained soils on bedrock-controlled uplands. These soils are moderately deep to sandstone bedrock. They formed dominantly in loess overlying sandy residuum derived from the underlying sandstone. Permeability is moderate in the silty and loamy mantle, rapid in the sandy residuum, and moderately slow or moderate in the sandstone. Slopes range from 6 to 25 percent.

Typical pedon of Gale silt loam, 12 to 25 percent slopes, eroded, approximately 2,340 feet south and 460 feet east of the northwest corner of sec. 22, T. 22 N., R. 6 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; weak coarse subangular blocky structure; friable; common fragments of dark yellowish brown (10YR 4/4) subsoil material; many very fine to coarse roots; slightly acid; abrupt smooth boundary.

Bt1—8 to 12 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium and coarse subangular blocky structure; friable; common very fine to coarse roots; common distinct dark brown (7.5YR 4/4) clay films on faces of peds; slightly acid; clear wavy boundary.

Bt2—12 to 22 inches; yellowish brown (10YR 5/4) silt loam; moderate medium and fine subangular blocky structure; friable; common very fine to medium roots; many distinct dark brown (7.5YR 4/4) clay films on faces of peds; strongly acid; clear wavy boundary.

Bt3—22 to 27 inches; yellowish brown (10YR 5/4) silt loam; moderate coarse subangular blocky structure; friable; common very fine to medium roots; many distinct dark brown (7.5YR 4/4) clay films on faces of peds; strongly acid; clear irregular boundary.

2Bt4—27 to 31 inches; yellowish brown (10YR 5/4) sandy loam; weak coarse subangular blocky structure; friable; few fine roots; few distinct dark brown (7.5YR 4/4) clay films on faces of peds; common prominent strong brown (7.5YR 5/6) iron coatings on faces of peds; strongly acid; abrupt wavy boundary.

3C—31 to 39 inches; brownish yellow (10YR 6/6) sand; single grain; loose; few strata of yellowish red (5YR 5/8) loamy sand; about 10 percent sandstone channers; strongly acid; clear wavy boundary.

3Cr—39 to 60 inches; brownish yellow (10YR 6/6) and strong brown (7.5YR 5/8) sandstone.

The thickness of the loess mantle and the depth to sandy residuum range from 15 to 39 inches. The depth to sandstone bedrock ranges from 20 to 40 inches. The volume of sandstone channers in the lower part of the solum and in the 3C horizon ranges from 0 to 35 percent. The Ap or A horizon has value of 3 or 4 and chroma of 2 or 3. The Bt horizon has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 4 to 6. It is silt loam or silty clay loam. The 2Bt horizon has hue of 7.5YR or 10YR and value and chroma of 4 to 6. It is loam or sandy loam or the channery analogs of these textures. The 3C horizon has hue of 7.5YR or 10YR, value of 4 to 7, and chroma of 3 to 8. It is sand or loamy sand or the channery analogs of these textures.

Gardenvale Series

The Gardenvale series consists of well drained soils on bedrock-controlled pediments. These soils are deep to sandstone bedrock. They formed in silty and loamy eolian deposits or alluvium overlying siliceous sandy residuum derived from the underlying sandstone. Permeability is moderate in the silty and loamy mantle, rapid in the sandy residuum, and moderately slow or moderate in the underlying sandstone. Slopes range from 1 to 6 percent.

Typical pedon of Gardenvale silt loam, in an area of Merit-Gardenvale silt loams, 1 to 6 percent slopes, approximately 700 feet north and 800 feet west of the center of sec. 15, T. 22 N., R. 5 W.

Ap—0 to 8 inches; dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; moderate medium subangular blocky structure; friable; many very fine and fine roots; moderately acid; abrupt wavy boundary.

Bt1—8 to 14 inches; dark brown (7.5YR 4/4) silt loam; moderate medium subangular blocky structure; friable; common very fine and fine roots; many faint dark brown (7.5YR 3/4) clay films on faces of most peds; moderately acid; clear wavy boundary.

Bt2—14 to 26 inches; dark brown (7.5YR 4/4) silt loam; moderate medium subangular blocky structure; friable; common very fine and fine roots; common faint dark brown (7.5YR 3/4) clay films on faces of most peds; very strongly acid; gradual irregular boundary.

2Bt3—26 to 30 inches; brown (7.5YR 5/4) sandy loam; moderate medium subangular blocky structure; friable; few very fine and fine roots; few faint dark brown (7.5YR 4/4) clay films on faces of some peds; moderately acid; clear wavy boundary.

3C—30 to 50 inches; reddish yellow (7.5YR 6/8) fine sand; single grain; loose; very strongly acid; clear wavy boundary.

3Cr—50 to 60 inches; reddish yellow (7.5YR 6/8) sandstone.

The thickness of the silty mantle ranges from 10 to 30 inches. The depth to sandy residuum ranges from 24 to 40 inches. The depth to sandstone ranges from 40 to 60 inches. The volume of sandstone channers ranges from 0 to 15 percent in the residuum. The A or Ap horizon has hue of 7.5YR or 10YR, value of 2 or 3, and chroma of 1 to 3. The Bt horizon has hue of 7.5YR or 10YR and value of 3 to 5. The 2Bt horizon has colors like those of the Bt horizon. It is typically sandy loam or loam but is sandy clay loam in some pedons. Some pedons have a 3Bt or 3BC horizon, which has hue of 7.5YR or 10YR and value and chroma of 4 to 6. This horizon is loamy sand or sand. The 3C horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 3 to 8. It is fine sand or sand. The 3Bt or 3BC horizon has less than 10 percent weatherable minerals in the sand fraction. In some pedons, the 3C horizon has few to many strata of sandy loam or loam.

Gosil Series

The Gosil series consists of very deep, excessively drained, rapidly permeable soils on stream terraces and pediments. These soils formed in siliceous sandy alluvium or siliceous residuum derived from sandstone. Slopes range from 0 to 12 percent.

Typical pedon of Gosil loamy sand, 0 to 6 percent slopes, approximately 1,640 feet south and 2,240 feet east of the northwest corner of sec. 35, T. 22 N., R. 5 W.

Ap—0 to 9 inches; dark brown (10YR 3/3) loamy sand, pale brown (10YR 6/3) dry; moderate medium subangular blocky structure parting to moderate fine granular; very friable; many very fine and fine roots; strongly acid; abrupt wavy boundary.

Bw1—9 to 14 inches; dark brown (7.5YR 4/4) loamy sand; moderate coarse subangular blocky structure; very friable; common very fine and fine roots; strongly acid; gradual wavy boundary.

Bw2—14 to 23 inches; brown (7.5YR 5/4) loamy sand; weak coarse subangular blocky structure; very friable; common very fine and fine roots; strongly acid; gradual wavy boundary.

BC—23 to 27 inches; strong brown (7.5YR 5/6) sand; weak coarse subangular blocky structure; very friable; few very fine roots; strongly acid; clear smooth boundary.

C1—27 to 33 inches; reddish yellow (7.5YR 6/8) sand; single grain; loose; strongly acid; gradual wavy boundary.

C2—33 to 60 inches; very pale brown (10YR 7/4) sand; single grain; loose; moderately acid.

The thickness of the solum ranges from 20 to 40 inches. The volume of sandstone channers ranges from 0 to 15 percent throughout the profile. The Ap horizon has hue of 7.5YR or 10YR, value of 2 or 3, and chroma of 1 to 3. Some pedons have an A horizon, which has colors and textures like those of the Ap horizon. The Bw horizon has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 4 to 6. It is

loamy sand or loamy fine sand. The BC horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6. It is sand or fine sand. The C horizon has hue of 7.5YR or 10YR, value of 5 to 8, and chroma of 2 to 8. It is sand or fine sand. Some pedons contain reddish strata 1/8 to 1 inch thick in the lower part of the C horizon. These strata are loamy sand, loamy fine sand, or sand.

Hiles Series

The Hiles series consists of moderately well drained soils on pediments. These soils are moderately deep to interbedded sandstone and shale bedrock. They formed in loess and in residuum derived from the underlying interbedded sandstone and shale. Permeability is moderate in the loess, moderately slow or moderate in the residuum, and extremely slow to moderately slow in the underlying interbedded sandstone and shale. Slopes range from 1 to 6 percent.

Typical pedon of Hiles silt loam, in an area of Hiles-Kert silt loams, 0 to 6 percent slopes, approximately 2,500 feet east of the center of sec. 9, T. 23 N., R. 4 W.

Ap—0 to 8 inches; dark brown (10YR 3/3) silt loam, light brownish gray (10YR 6/2) dry; weak fine subangular blocky structure; friable; many very fine and fine roots; strongly acid; abrupt wavy boundary.

E—8 to 12 inches; brown (10YR 5/3) silt loam, very pale brown (10YR 7/3) dry; moderate medium platy structure; friable; common very fine and fine roots; strongly acid; clear wavy boundary.

B/E—12 to 20 inches; about 60 percent dark yellowish brown (10YR 4/4) silt loam (Bt); moderate fine subangular blocky structure; friable; common faint dark brown (7.5YR 4/4) clay films on faces of peds; penetrated by tongues of brown (10YR 5/3) silt loam (E), very pale brown (10YR 7/3) dry; weak medium platy structure; friable; common very fine and fine roots; strongly acid; clear wavy boundary.

2Bt—20 to 28 inches; dark yellowish brown (10YR 4/4) loam; moderate medium subangular blocky structure; friable; common very fine and fine roots; common distinct dark brown (7.5YR 4/3) clay films on faces of peds; few fine prominent reddish yellow (5YR 6/6) masses of iron accumulation; about 5 percent sandstone channers; very strongly acid; clear wavy boundary.

2Cr—28 to 60 inches; light gray (5Y 7/2), light greenish gray (5GY 7/1), and reddish yellow (7.5YR 6/8), interbedded sandstone and shale.

The depth to the base of the argillic horizon and to interbedded sandstone and shale ranges from 20 to 40 inches. Thickness of the loess mantle ranges from 12 to 24 inches. The volume of sandstone channers ranges from 2 to 10 percent in the residuum. The Ap or A horizon has value of 2 to 4 and chroma of 1 to 3. The E horizon has value of 4 to 6 and chroma of 2 or 3. Some pedons have an E/B horizon. The E part of the E/B or B/E horizon has colors and textures like those of the E horizon. The Bt part of the E/B or B/E horizon has value of 3 to 5 and chroma of 4 to 6. Some pedons have a Bt horizon. The 2Bt horizon has hue of 2.5YR, 5YR, 7.5YR, 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 2 to 4. It is dominantly loam, clay loam, or sandy clay loam, but in some pedons it has subhorizons of finer or coarser textures, which reflect the interbedding of the sandstone and shale.

Hixton Series

The Hixton series consists of well drained soils on bedrock-controlled uplands. These soils are moderately deep to sandstone bedrock. They formed dominantly in loamy colluvium overlying siliceous sandy residuum derived from the underlying sandstone. Permeability is moderate in the loamy colluvium, rapid in the sandy residuum, and moderately slow or moderate in the underlying sandstone. Slopes range from 2 to 20 percent.

Typical pedon of Hixton loam, 6 to 12 percent slopes, eroded, approximately 1,240 feet north and 2,240 feet east of the southwest corner of sec. 24, T. 24 N., R. 5 W.

Ap—0 to 9 inches; dark brown (10YR 3/3) loam, pale brown (10YR 6/3) dry; moderate medium subangular blocky structure; friable; common very fine and fine roots; common fragments of dark yellowish brown (10YR 4/4) subsoil material; slightly acid; abrupt smooth boundary.

Bt1—9 to 17 inches; dark yellowish brown (10YR 4/4) loam; moderate fine subangular blocky structure; friable; common very fine and fine roots; common distinct dark brown (7.5YR 4/4) clay films on faces of peds; moderately acid; clear wavy boundary.

Bt2—17 to 28 inches; dark yellowish brown (10YR 4/4) loam; moderate medium subangular blocky structure; friable; common very fine and fine roots; many distinct dark brown (7.5YR 4/4) clay films on faces of peds; strongly acid; clear wavy boundary.

2Bt3—28 to 32 inches; dark yellowish brown (10YR 4/4) sandy loam; weak medium subangular blocky structure; friable; few very fine roots; common distinct dark brown (7.5YR 4/4) clay films on faces of peds; about 5 percent sandstone channers; strongly acid; clear wavy boundary.

3C—32 to 39 inches; brownish yellow (10YR 6/6) sand; single grain; loose; about 5 percent channers; strongly acid; abrupt smooth boundary.

3Cr—39 to 60 inches; strong brown (7.5YR 5/6) sandstone.

The thickness of the loamy mantle and the depth to siliceous sandy residuum range from 15 to 39 inches. The depth to sandstone ranges from 20 to 40 inches. The volume of sandstone channers ranges from 0 to 35 percent in the 2Bt horizon and in the sandy residuum. The Ap or A horizon has value of 3 or 4 and chroma of 2 to 4. Some pedons have an E horizon, which has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. This horizon is loam. The Bt and 2Bt horizons have hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 or 4. The Bt horizon is loam or sandy clay loam. The 2Bt horizon is sandy loam or loam or the channery analogs of these textures. The 3C horizon has hue of 7.5YR or 10YR, value of 4 to 7, and chroma of 3 to 8. It is sand or fine sand or the channery analogs of these textures.

Hoop Series

The Hoop series consists of very deep, somewhat poorly drained soils on stream terraces and pediments. These soils formed in siliceous loamy alluvium overlying siliceous sandy alluvium. Permeability is moderate in the loamy alluvium and rapid or very rapid in the sandy alluvium. Slopes range from 0 to 3 percent.

Typical pedon of Hoop sandy loam, 0 to 3 percent slopes, approximately 500 feet south and 300 feet east of the northwest corner of sec. 36, T. 22 N., R. 4 W.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) sandy loam, brown (10YR 5/3) dry; moderate medium subangular blocky structure parting to weak medium granular; friable; common very fine and fine roots; slightly acid; abrupt smooth boundary.

A—7 to 11 inches; very dark grayish brown (10YR 3/2) sandy loam, brown (10YR 5/3) dry; moderate coarse subangular blocky structure; friable; common very fine and fine roots; slightly acid; abrupt wavy boundary.

Bt1—11 to 17 inches; dark yellowish brown (10YR 4/4) sandy loam; moderate coarse subangular blocky structure; friable; common very fine and fine roots; few faint brown (10YR 4/3) clay films on faces of peds; few medium distinct grayish brown (10YR 5/2) masses of iron depletion; moderately acid; clear irregular boundary.

Bt2—17 to 24 inches; grayish brown (10YR 5/2) sandy loam; weak coarse subangular blocky structure; friable; common very fine and fine roots; few faint brown (10YR 4/3) clay films on faces of peds; many coarse distinct yellowish brown (10YR 5/6) and prominent red (2.5YR 4/6) masses of iron accumulation; strongly acid; abrupt irregular boundary.

2BC—24 to 34 inches; brownish yellow (10YR 6/6) sand; single grain; loose; few very fine and fine roots; common coarse prominent strong brown (7.5YR 5/8) masses of iron accumulation; moderately acid; clear wavy boundary.

2C—34 to 60 inches; light brownish gray (10YR 6/2) sand; single grain; loose; common coarse distinct yellow (10YR 7/6) masses of iron accumulation; moderately acid.

The thickness of the loamy mantle and the depth to siliceous sandy alluvium range from 20 to 35 inches. The thickness of the mollic epipedon ranges from 8 to 14 inches. The Ap or A horizon has value of 2 or 3 and chroma of 1 to 3. The Bt horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 2 to 4. It is sandy loam or fine sandy loam. The 2BC or 2Bt horizon has hue of 7.5YR, 10YR, or 2.5Y, value of 4 to 6, and chroma of 2 to 8. It is sand, coarse sand, loamy sand, or loamy coarse sand. The 2C horizon has hue of 7.5YR or 10YR, value of 4 to 8, and chroma of 2 to 6. It is sand or coarse sand.

Houghton Series

The Houghton series consists of very deep, very poorly drained soils on flood plains. These soils formed in organic material more than 51 inches thick. Permeability is moderately slow to moderately rapid. Slopes are 0 to 1 percent.

Typical pedon of Houghton muck, 0 to 1 percent slopes, approximately 1,400 feet north and 640 feet west of the center of sec. 22, T. 22 N., R. 6 W.

Oa1—0 to 4 inches; muck (sapric material), very dark brown (10YR 2/2) broken face and rubbed; about 30 percent fiber, 15 percent rubbed; nonsticky; many very fine to medium roots; slightly acid (pH 6.4 in water); clear smooth boundary.

Oa2—4 to 16 inches; muck (sapric material), black (10YR 2/1) broken face and rubbed; about 20 percent fiber, 5 percent rubbed; weak medium subangular blocky structure; nonsticky; common very fine and fine roots; strongly acid; (pH 5.5 in water); gradual wavy boundary.

Oa3—16 to 22 inches; muck (sapric material), black (10YR 2/1) broken face and rubbed; about 35 percent fiber, 10 percent rubbed; weak coarse subangular blocky structure; nonsticky; few very fine and fine roots; strongly acid (pH 5.5 in water); clear wavy boundary.

Oe—22 to 28 inches; mucky peat (hemic material), dark brown (7.5YR 3/2) broken face and rubbed; about 80 percent fiber, 20 percent rubbed; massive parting to weak thick platy structure; nonsticky; strongly acid (pH 5.5 in water); clear wavy boundary.

O'a1—28 to 40 inches; muck (sapric material), black (10YR 2/1) broken face and rubbed; about 40 percent fiber, 10 percent rubbed; massive; nonsticky; strongly acid (pH 5.1 in water); clear wavy boundary.

O'a2—40 to 60 inches; muck (sapric material), black (10YR 2/1) broken face and rubbed; about 40 percent fiber, 10 percent rubbed; massive; nonsticky; strongly acid (pH 5.1 in water).

The organic material is more than 51 inches thick. It is dominantly muck, but some pedons have thin layers of mucky peat or peat. The muck has hue of 7.5YR or 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 2.

Humbird Series

The Humbird series consists of moderately well drained soils on pediments. These soils are moderately deep to interbedded sandstone and shale bedrock (fig. 17). They formed in loamy alluvium and in clayey residuum derived from the underlying interbedded sandstone and shale. Permeability is moderate or moderately rapid in the loamy alluvium, slow in the clayey residuum, and extremely slow to moderately slow in the underlying interbedded sandstone and shale. Slopes range from 1 to 6 percent.

Typical pedon of Humbird fine sandy loam, in an area of Humbird-Merrillan fine sandy loams, 0 to 6 percent slopes, approximately 2,440 feet west of the center of sec. 3, T. 23 N., R. 1 W.

Oe—0 to 1 inch; partially decomposed, very dark grayish brown (10YR 3/2) mucky peat (hemic material, which is a mat of forest litter); about 40 percent fiber, 20 percent rubbed; weak thin platy structure; nonsticky; common very fine and fine roots; extremely acid; abrupt smooth boundary.

A—1 to 3 inches; black (10YR 2/1) fine sandy loam, dark gray (10YR 4/1) dry; weak fine granular structure; very friable; many fine roots; extremely acid; abrupt smooth boundary.

E—3 to 6 inches; grayish brown (10YR 5/2) fine sandy loam, light brownish gray (10YR 6/2) dry; moderate thin platy structure; very friable; common coarse to fine roots; extremely acid; clear wavy boundary.

Bs—6 to 18 inches; dark brown (7.5YR 4/4) fine sandy loam; weak fine and medium subangular blocky structure; very friable; common coarse to fine roots; very strongly acid; abrupt wavy boundary.

2Bt—18 to 24 inches; reddish brown (5YR 4/4) silty clay; strong medium angular blocky structure; firm; few fine and medium roots; many distinct dusky red (2.5YR 3/2) clay films on faces of peds; about 5 percent sandstone channers; extremely acid; clear wavy boundary.

2Btg—24 to 30 inches; light olive gray (5Y 6/2) silty clay; common fine prominent strong brown (7.5YR 5/8) masses of iron accumulation; moderate medium subangular blocky structure; few fine roots; common faint olive gray (5Y 5/2) clay films on faces of peds; about 10 percent sandstone channers; firm; extremely acid; clear wavy boundary.

2Cr—30 to 60 inches; interbedded light gray (5Y 7/2) sandstone and red (2.5YR 4/6) shale.

Thickness and depth in this paragraph are measured from the top of the mineral soil. The thickness of the solum and the depth to interbedded sandstone and shale range from 24 to 40 inches. The thickness of the loamy mantle and the depth to clayey residuum range from 12 to 30 inches. The volume of sandstone channers ranges from 0 to 15 percent throughout the profile.

The O horizon has hue of 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 3. The A horizon has value of 2 or 3 and chroma of 1 or 2. Some pedons have an Ap horizon, which has value of 3 or 4 and chroma of 2 or 3. The E horizon has value of 4 or 5 and chroma of 2 or 3. It is fine sandy loam or sandy loam. The Bs horizon has value and chroma of 3 or 4. It is fine sandy loam or sandy loam. The 2Bt horizon has hue of 2.5YR, 5YR, 7.5YR, 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 2 to 4. It is dominantly clay loam, silty clay loam, silty clay, or clay, but thin subhorizons of coarser textures are in some pedons .

Impact Series

The Impact series consists of very deep, excessively drained, rapidly permeable soils on stream terraces and pediments. These soils formed in siliceous sandy alluvium or residuum. Slopes range from 0 to 3 percent.

Typical pedon of Impact sand, 0 to 3 percent slopes, approximately 1,600 feet north and 600 feet west of the southeast corner of sec. 31, T. 19 N., R. 5 W.

Ap—0 to 6 inches; very dark grayish brown (10YR 3/2) sand, grayish brown (10YR 5/2) dry; weak medium subangular blocky structure; very friable; common very fine to medium roots; slightly acid; abrupt smooth boundary.

A1—6 to 9 inches; very dark grayish brown (10YR 3/2) sand, brown (10YR 5/3) dry; weak coarse subangular blocky structure; very friable; common very fine to medium roots; slightly acid; clear wavy boundary.

A2—9 to 14 inches; dark brown (10YR 3/3) sand, brown (10YR 5/3) dry; weak coarse subangular blocky structure; very friable; common fine and medium roots; strongly acid; clear irregular boundary.

Bw—14 to 24 inches; dark brown (7.5YR 4/4) sand; weak coarse subangular blocky structure; very friable; few fine roots; strongly acid; gradual wavy boundary.

BC—24 to 30 inches; strong brown (7.5YR 5/6) sand; weak medium subangular blocky structure; very friable; moderately acid; clear wavy boundary.

C—30 to 60 inches; brownish yellow (10YR 6/6) sand; single grain; loose; moderately acid.

The thickness of the solum ranges from 20 to 40 inches. The thickness of the umbric epipedon ranges from 10 to 16 inches. The Ap or A horizon has hue of 7.5YR or 10YR, value of 2 or 3, and chroma of 1 to 3. The Bw horizon has hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 4 to 6. It is sand, fine sand, loamy sand, or loamy fine sand. The BC horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 3 to 8. The C horizon has hue of 7.5YR or 10YR, value of 4 to 7, and chroma of 1 to 8. The BC and C horizons are sand or fine sand.

Ironrun Series

The Ironrun series consists of very deep, somewhat poorly drained soils on stream terraces and pediments (fig. 18). These soils formed in siliceous sandy alluvium. Permeability is rapid or very rapid. Slopes range from 0 to 3 percent.

Typical pedon of Ironrun sand, in an area of Ironrun-Ponycreek complex, 0 to 3 percent slopes, approximately 1,000 feet north and 175 feet west of the southeast corner of sec. 15, T. 20 N., R. 2 W.

Oe—0 to 2 inches; very dark grayish brown (10YR 3/2) mucky peat (hemic material, which is a mat of partially decomposed forest litter); about 50 percent fiber, 25 percent rubbed; weak thin platy structure; nonsticky; extremely acid; abrupt smooth boundary.

A—2 to 4 inches; black (N 2/0) sand, black (10YR 2/1) dry; weak fine and medium granular structure; very friable; many fine and medium roots; extremely acid; abrupt smooth boundary.

E—4 to 12 inches; gray (10YR 5/1) sand, light brownish gray (10YR 6/2) dry; weak coarse subangular blocky structure; very friable; common very fine and fine roots; common distinct very dark gray (10YR 3/1) organic coatings on sand grains; strongly acid; abrupt irregular boundary.

Bhs—12 to 16 inches; dark reddish brown (5YR 3/2) sand; weak coarse subangular blocky structure; very friable; common very fine and fine roots; very strongly acid; clear wavy boundary.

Bs1—16 to 24 inches; reddish brown (5YR 4/4) sand; weak coarse subangular blocky structure; very friable; common very fine and fine roots; few fine distinct brown (7.5YR 5/4) masses of iron accumulation; strongly acid; clear wavy boundary.

Bs2—24 to 30 inches; dark brown (7.5YR 4/4) sand; weak coarse subangular blocky structure; very friable; few fine roots; few fine faint brown (7.5YR 5/4) masses of iron accumulation; strongly acid; clear wavy boundary.

C—30 to 62 inches; yellow (10YR 7/6) sand; single grain; loose; common medium prominent (7.5YR 5/8) masses of iron accumulation; moderately acid.

Thickness is measured from the top of the mineral soil. The thickness of the solum ranges from 20 to 40 inches. The volume of gravel and channers ranges from 0 to 15 percent throughout the profile.

The O horizon has hue of 7.5YR or 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 3. The A horizon has hue of 5YR, 7.5YR, or 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 2. The E horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 1 or 2. It is sand or

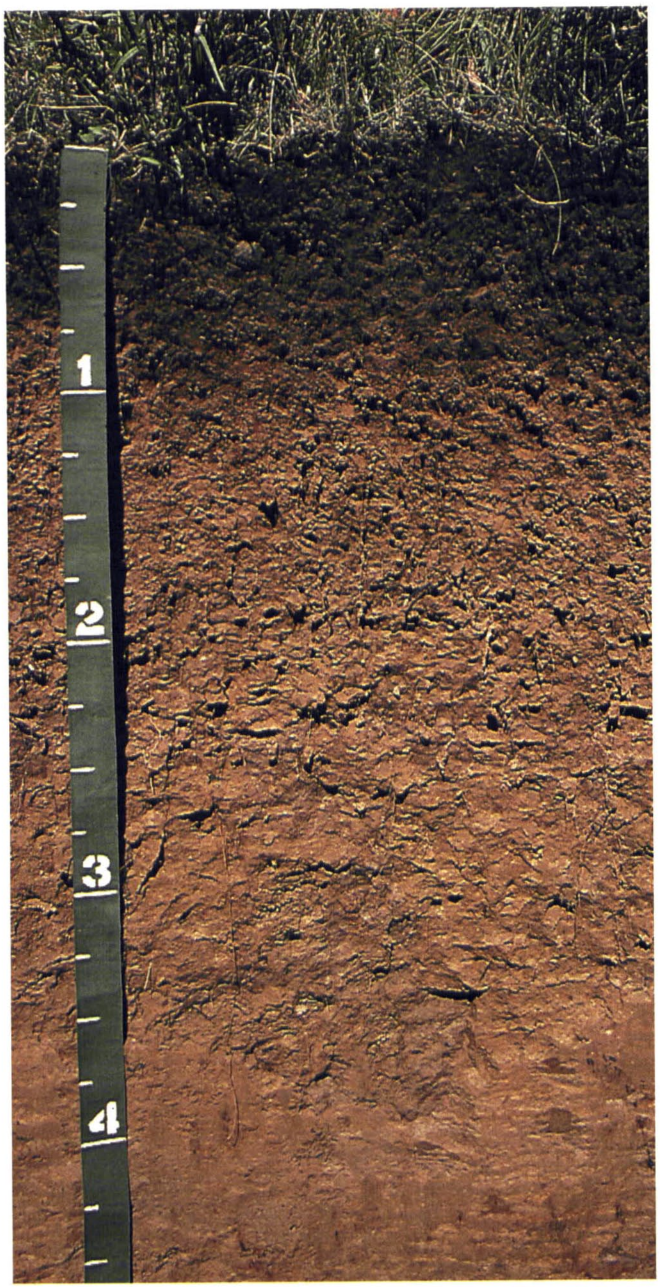

Figure 16.—Profile of a Council soil. This soil formed mostly in loamy colluvium. Depth is marked in feet.

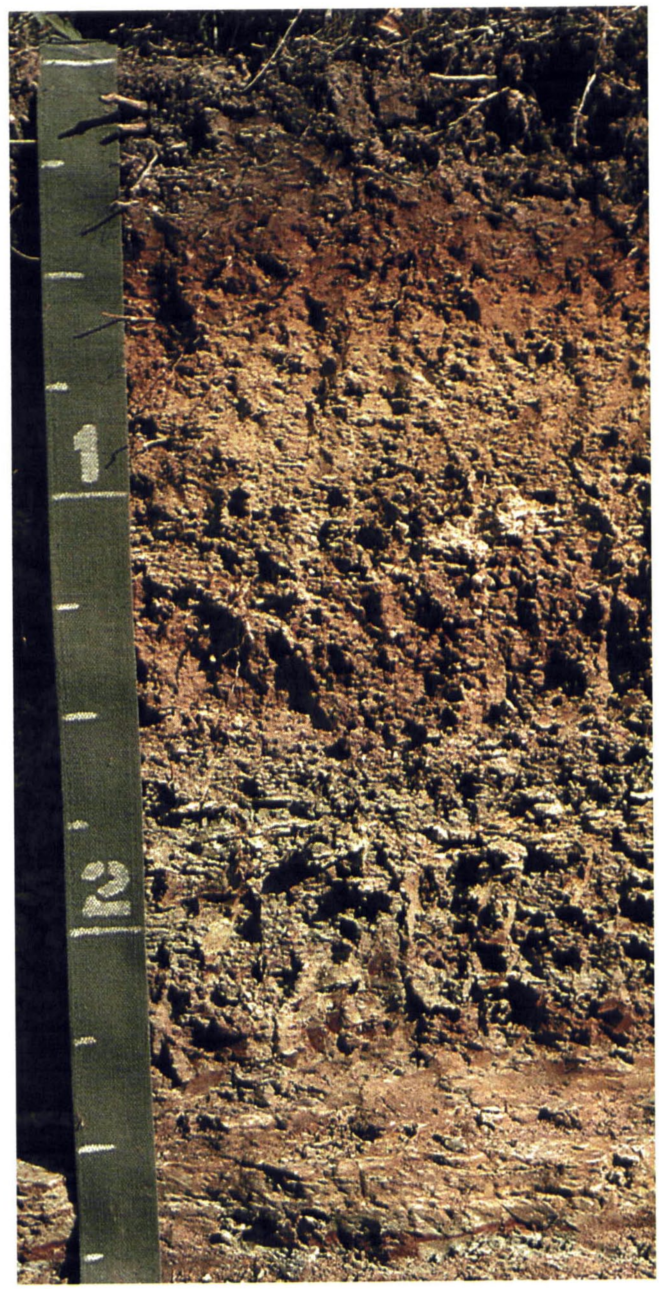

Figure 17.—Profile of a Humbird soil. Interbedded sandstone and shale are at a depth of about 33 inches. Depth is marked in feet.

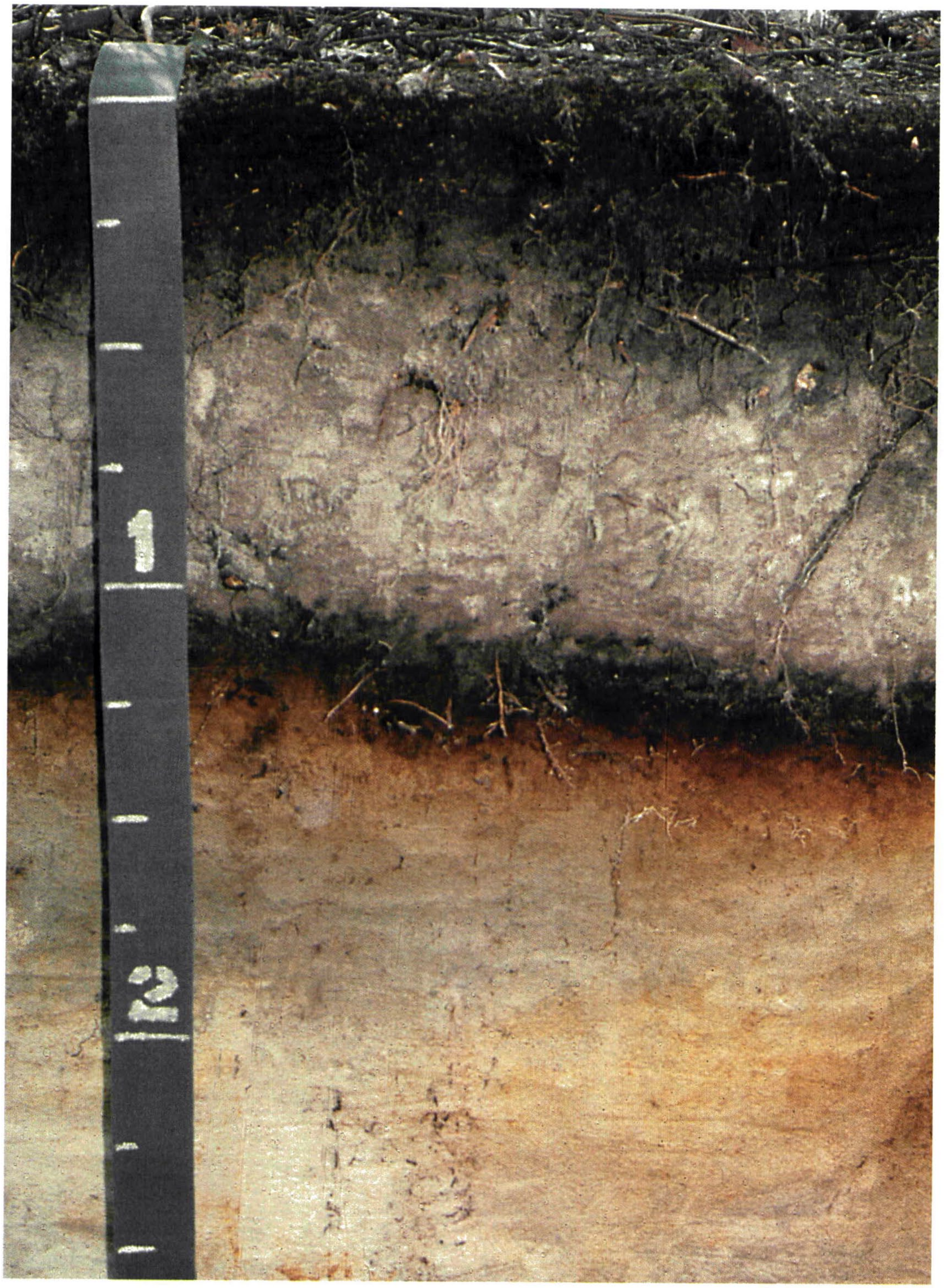

Figure 18.—Profile of an Ironrun soil. Organic matter and iron and aluminum compounds have been leached from the light colored subsurface layer and deposited in the dark upper part of the subsoil. Depth is marked in feet.

Figure 19.—Profile of a La Farge soil. Fine grained glauconitic sandstone is at a depth of about 35 inches. Depth is marked in feet.

Figure 20.—Profile of a Merimod soil. Siliceous sandy alluvium is at a depth of about 36 inches. Depth is marked in feet.

Figure 21.—Profile of a Rockdam soil. This soil formed in siliceous sandy deposits or residuum derived from sandstone. Depth is marked in feet.

coarse sand. The Bhs horizon has hue of 5YR or 7.5YR and value and chroma of 2 or 3. It is sand or coarse sand. The Bs horizon has hue of 5YR or 7.5YR, value of 3 to 5, and chroma of 4 to 6. It is sand or coarse sand. Some pedons have up to 30 percent weakly to strongly cemented ortstein in the B horizon. The C horizon has hue of 7.5YR or 10YR, value of 4 to 7, and chroma of 1 to 8. It is sand or coarse sand.

Jackson Series

The Jackson series consists of very deep, moderately well drained soils on stream terraces and pediments. These soils formed mostly in silty alluvium overlying stratified sandy alluvium. Permeability is moderate in the silty and loamy alluvium and rapid in the sandy alluvium. Slopes range from 0 to 6 percent.

Typical pedon of Jackson silt loam, 2 to 6 percent slopes, approximately 2,540 feet west and 40 feet south of the center of sec. 26, T. 19 N., R. 6 W.

Ap—0 to 9 inches; dark brown (10YR 3/3) silt loam, pale brown (10YR 6/3) dry; weak medium and fine subangular blocky structure parting to weak medium granular; friable; many fine roots; moderately acid; abrupt smooth boundary.

Bt1—9 to 15 inches; dark brown (7.5YR 4/4) silt loam; weak medium and fine subangular blocky structure; friable; common fine roots; few faint dark brown (7.5YR 4/4) clay films on faces of peds; moderately acid; clear wavy boundary.

Bt2—15 to 24 inches; dark brown (7.5YR 4/4) silt loam; moderate medium subangular blocky structure; friable; common fine roots; common faint dark brown (7.5YR 4/4) clay films on faces of peds; moderately acid; clear irregular boundary.

Bt3—24 to 34 inches; dark brown (7.5YR 4/4) silt loam; weak medium subangular blocky structure; friable; common fine roots; few faint dark brown (7.5YR 4/4) clay films on faces of peds; moderately acid; clear wavy boundary.

Bt4—34 to 50 inches; dark yellowish brown (10YR 4/4) silt loam; common coarse faint brown (10YR 5/3) and common fine prominent yellowish red (5YR 4/6) masses of iron accumulation; weak coarse subangular blocky structure; friable; common fine roots; few faint dark yellowish brown (10YR 3/4) clay films on faces of peds; moderately acid; clear wavy boundary.

3C—50 to 60 inches; stratified brownish yellow (10YR 6/6) and yellowish brown (10YR 5/4) fine sand; thin strata of yellowish brown (10YR 5/4) loamy fine sand; single grain; loose; moderately acid.

The thickness of the silty alluvium, the depth to the base of the argillic horizon, and the depth to sandy alluvium range from 40 to 60 inches. The Ap or A horizon has value of 3 or 4 and chroma of 2 or 3. The Bt horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 or 4. It is silt loam or silty clay loam. The 3C horizon has hue of 7.5YR or 10YR, value of 4 to 8, and chroma of 2 to 6. It is stratified fine sand, sand, loamy fine sand, or loamy sand. Some pedons have thin strata of fine sandy loam or silt loam in the C horizon.

Kalmarville Series

The Kalmarville series consists of very deep, poorly drained soils on flood plains. These soils formed in recent loamy alluvium over sandy alluvium. Permeability is moderate or moderately rapid in the loamy alluvium and rapid in the sandy alluvium. Slopes are 0 to 1 percent.

Typical pedon of Kalmarville silt loam, 0 to 1 percent slopes, approximately 1,640 feet north and 440 feet east of the center of sec. 5, T. 19 N., R. 5 W.

A1—0 to 6 inches; very dark brown (10YR 2/2) silt loam, grayish brown (10YR 5/2) dry; weak coarse granular structure; friable; many very fine to medium roots; few fine prominent dark red (2.5YR 3/6) masses of iron accumulation; slightly acid; clear smooth boundary.

A2—6 to 37 inches; dark gray (10YR 4/1) very fine sandy loam; common thin strata of grayish brown (10YR 5/2) and dark grayish brown (10YR 4/2) silt loam and fine sandy loam; massive but breaks to medium plates along depositional strata; friable; common very fine to medium roots; few coarse prominent dark red (2.5YR 3/6) masses of iron accumulation; slightly acid; clear smooth boundary.

Cg1—37 to 42 inches; light brownish gray (10YR 6/2) fine sandy loam; a few thin strata of grayish brown (10YR 5/2) very fine sandy loam and silt loam; massive but breaks to thick plates along depositional strata; friable; few medium prominent yellowish red (5YR 4/6) masses of iron accumulation; slightly acid; abrupt smooth boundary.

Cg2—42 to 60 inches; light brownish gray (10YR 6/2) sand; single grain; loose; slightly acid.

The thickness of the loamy alluvium and the depth

to sandy alluvium range from 40 to 60 inches. The A horizon has value of 2 or 3 and chroma of 1 or 2. The loamy upper part of the Cg horizon has hue of 7.5YR, 10YR, or 2.5Y, value of 4 to 6, and chroma of 1 or 2. It is commonly stratified very fine sandy loam, silt loam, loam, fine sandy loam, or sandy loam but has thin strata of coarser textures in some pedons. The sandy lower part of the Cg horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 or 2. It is sand, fine sand, or coarse sand.

Kert Series

The Kert series consists of somewhat poorly drained soils on pediments. These soils are moderately deep to interbedded sandstone and shale. They formed in loess and residuum derived from the underlying interbedded sandstone and shale. Permeability is moderate in the loess, moderately slow or moderate in the residuum, and extremely slow to moderately slow in the underlying interbedded sandstone and shale. Slopes range from 0 to 3 percent.

Typical pedon of Kert silt loam, 0 to 3 percent slopes, approximately 300 feet north and 2,300 feet west of the center of sec. 4, T. 22 N., R. 1 E.

Oe—0 to 1 inch; partially decomposed, very dark grayish brown (10YR 3/2) mucky peat (hemic material, which is a mat of forest litter); about 45 percent fiber, 20 percent rubbed; weak thin platy structure; nonsticky; many fine roots; very strongly acid; abrupt smooth boundary.

A—1 to 3 inches; black (10YR 2/1) silt loam, dark grayish brown (10YR 4/2) dry; weak coarse granular structure; friable; many fine roots; very strongly acid; abrupt wavy boundary.

E—3 to 8 inches; brown (10YR 5/3) silt loam, light gray (10YR 7/2) dry; moderate medium subangular blocky structure parting to weak thin platy; friable; common fine roots; very strongly acid; clear wavy boundary.

B/E—8 to 19 inches; about 70 percent dark yellowish brown (10YR 4/4) silt loam (Bt); moderate medium subangular blocky structure; friable; common faint dark yellowish brown (10YR 3/4) clay films on faces of peds; penetrated by tongues of brown (10YR 5/3) silt loam (E), very pale brown (10YR 7/3) dry; weak medium subangular blocky structure; friable; common fine roots; few fine distinct and faint dark grayish brown (10YR 4/2) masses of iron depletion; common fine prominent yellowish red (5YR 5/8) masses of iron accumulation; very strongly acid; clear wavy boundary.

2Bt—19 to 31 inches; olive gray (5Y 5/2) silty clay loam; strong medium subangular blocky structure; firm; common fine roots; few prominent dark grayish brown (10YR 4/2) clay films on faces of peds; common fine prominent yellowish red (5YR 5/8) masses of iron accumulation; about 10 percent sandstone channers; more than 15 percent fine sand or coarser; very strongly acid; gradual wavy boundary.

2Cr—31 to 60 inches; light gray (5Y 7/2), interbedded sandstone and shale.

Thickness in this paragraph is measured from the top of the mineral soil. The thickness of the solum and the depth to interbedded sandstone and shale range from 20 to 40 inches. The thickness of the loess mantle and the depth to loamy residuum range from 12 to 24 inches.

The O horizon has hue of 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 2. The A or Ap horizon has value of 2 or 3 and chroma of 1 to 3. The E horizon has value of 4 to 6 and chroma of 2 or 3. It is silt loam or silt. Some pedons have an E/B horizon. The E part of the E/B or B/E horizon has colors and textures like those of the E horizon. The Bt horizon or the Bt part of the E/B or B/E horizon has hue of 7.5YR or 10YR and value and chroma of 4 or 5. Some pedons have a 2E/B or 2B/E horizon. The 2E part has hue of 5YR, 7.5YR, 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 2 or 3. It is loam, silty clay loam, or sandy clay loam. The 2Bt part has colors and textures like those of the 2Bt horizon. The 2Bt horizon has hue of 2.5YR, 5YR, 7.5YR, 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 2 to 6. It is dominantly silty clay loam, clay loam, sandy clay loam, or loam; in some pedons, however, it contains thin subhorizons of coarser or finer textures, which reflect the interbedding of the sandstone and shale. The volume of sandstone channers ranges from 0 to 15 percent in the 2Bt horizon.

La Farge Series

The La Farge series consists of well drained soils on bedrock-controlled uplands. These soils are moderately deep to sandstone bedrock (fig. 19). They formed mostly in loess and in loamy residuum derived from the underlying fine grained glauconitic sandstone. Permeability is moderate in the subsoil and slow to moderate in the underlying sandstone. Slopes range from 4 to 25 percent.

Typical pedon of La Farge silt loam, 4 to 12 percent slopes, eroded, approximately 700 feet north and 1,940 feet west of the center of sec. 34, T. 21 N., R. 6 W.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) silt loam, brown (10YR 5/3) dry; moderate coarse subangular blocky structure; friable; common coarse and medium fragments of yellowish brown (10YR 5/4) subsoil material; many fine or medium roots; neutral; abrupt smooth boundary.

Bt1—6 to 10 inches; yellowish brown (10YR 5/4) silt loam; moderate very thick platy structure parting to moderate medium subangular blocky; friable; common very fine to medium roots; few faint dark yellowish brown (10YR 4/4) clay films on faces of peds; slightly acid; clear wavy boundary.

Bt2—10 to 22 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium subangular blocky structure; friable; common very fine to medium roots; common faint dark yellowish brown (10YR 4/4) clay films on faces of peds; moderately acid; clear wavy boundary.

Bt3—22 to 28 inches; dark yellowish brown (10YR 4/4) silt loam; moderate coarse subangular blocky structure; friable; common very fine and fine roots; few faint dark yellowish brown (10YR 3/4) clay films on faces of peds; strongly acid; clear wavy boundary.

2Bt4—28 to 37 inches; olive brown (2.5Y 4/4) loam; weak coarse subangular blocky structure; friable; few very fine and fine roots; few distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; about 5 percent sandstone channers; strongly acid; abrupt wavy boundary.

2Cr—37 to 60 inches; yellowish brown (10YR 5/6), fine grained glauconitic sandstone.

The thickness of the loess mantle and the depth to sandstone bedrock range from 20 to 40 inches. The Ap horizon has value of 3 or 4 and chroma of 1 or 2. Some pedons have an E horizon, which has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. It is silt loam. The Bt horizon has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 3 or 4. It is silt loam or silty clay loam. The 2Bt horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 3 or 4. It is loam, sandy clay loam, sandy loam, or fine sandy loam. The volume of sandstone channers ranges from 0 to 15 percent in the 2Bt and 2BC horizons.

Loxley Series

The Loxley series consists of very deep, very poorly drained soils on lake plains. These soils formed in organic material more than 51 inches thick. Permeability is moderately slow to moderately rapid. Slopes are 0 to 1 percent.

Typical pedon of Loxley peat, 0 to 1 percent slopes, approximately 1,800 feet north and 800 feet east of the southwest corner of sec. 34, T. 20 N., R. 1 W.

Oi—0 to 4 inches; peat (fibric material), reddish brown (2.5YR 4/4) broken face and rubbed; about 70 percent fiber, 50 percent rubbed; weak very thick platy structure; nonsticky; many very fine to medium roots; some woody stems; extremely acid (pH 4.4 in water); abrupt smooth boundary.

Oa1—4 to 10 inches; muck (sapric material), black (5YR 2.5/1) broken face and rubbed; about 10 percent fibers, less than 5 percent rubbed; weak coarse granular structure; slightly sticky; many very fine and fine roots; extremely acid (pH 4.0 in water); clear wavy boundary.

Oa2—10 to 16 inches; muck (sapric material), black (N 2/0) broken face and rubbed; about 10 percent fibers, less than 5 percent rubbed; massive; slightly sticky; common very fine and fine roots; extremely acid (pH 4.2 in water); clear wavy boundary.

Oa3—16 to 52 inches; muck (sapric material), black (10YR 2/1) broken face and rubbed; about 40 percent fibers, 10 percent rubbed; massive; slightly sticky; extremely acid (pH 4.4 in water); clear wavy boundary.

Oe—52 to 60 inches; mucky peat (hemic material), very dark grayish brown (10YR 3/2) broken face and rubbed; about 70 percent fibers, about 20 percent rubbed; massive; nonsticky; extremely acid (pH 4.4 in water).

The thickness of the organic material is more than 51 inches. The peat and mucky peat have hue of 2.5YR, 5YR, 7.5YR, or 10YR, value of 3 to 5, and chroma of 2 to 4. The muck has hue of 5YR, 7.5YR, or 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 2.

Ludington Series

The Ludington series consists of moderately well drained soils on pediments. These soils are moderately deep to interbedded sandstone and shale bedrock. They formed in siliceous sandy alluvium and in loamy residuum derived from the underlying interbedded sandstone and shale. Permeability is rapid in the sandy alluvium, moderately slow or moderate in the loamy residuum, and extremely slow to moderately slow in the underlying interbedded

sandstone and shale. Slopes range from 1 to 6 percent.

Typical pedon of Ludington sand, 1 to 6 percent slopes, approximately 1,700 feet south and 400 feet east of the northwest corner of sec. 8, T. 22 N., R. 1 W.

Oe—0 to 2 inches; very dark grayish brown (10YR 3/2) mucky peat (hemic material, which is a mat of partially decomposed leaf and grass litter); about 50 percent fiber, 25 percent rubbed; weak thin platy structure; nonsticky; very strongly acid; abrupt wavy boundary.

A—2 to 4 inches; very dark gray (10YR 3/1) sand, dark gray (10YR 4/1) dry; weak fine granular structure; very friable; common very fine and fine roots; strongly acid; abrupt smooth boundary.

E—4 to 6 inches; grayish brown (10YR 5/2) sand, light gray (10YR 7/2) dry; weak fine subangular blocky structure; very friable; common fine roots; strongly acid; abrupt wavy boundary.

Bs1—6 to 12 inches; dark brown (7.5YR 4/4) sand; weak fine subangular blocky structure; very friable; common fine roots; strongly acid; abrupt wavy boundary.

Bs2—12 to 20 inches; brown (7.5YR 5/4) sand; weak fine subangular blocky structure; very friable; common fine roots; strongly acid; clear wavy boundary.

Bw—20 to 28 inches; yellowish brown (7.5YR 5/6) sand; weak fine subangular blocky structure; very friable; common fine roots; common medium faint brownish yellow (7.5YR 6/6) masses of iron accumulation; strongly acid; clear smooth boundary.

2Bt—28 to 39 inches; pale olive (5Y 6/3) clay loam; strong medium subangular blocky structure; firm; few very fine roots; common distinct dark grayish brown (2.5Y 4/2) clay films on faces of peds; many fine prominent yellowish brown (10YR 5/8) masses of iron accumulation; about 5 percent sandstone channers; very strongly acid; abrupt smooth boundary.

2Cr—39 to 60 inches; very pale brown (10YR 7/4), interbedded sandstone and shale.

Thickness and depth in this paragraph are measured from the top of the mineral soil. The thickness of the sandy mantle and the depth to loamy residuum range from 15 to 39 inches. The thickness of the solum and the depth to bedrock range from 20 to 40 inches. The volume of sandstone channers ranges from 0 to 15 percent in the sandy alluvium and from 3 to 15 percent in the residuum.

The O horizon has hue of 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 or 1. The A or Ap horizon has value of 2 or 3 and chroma of 1 or 2. The E horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 2 or 3. It is sand or loamy sand. The Bs horizon has hue of 5YR or 7.5YR, value of 3 to 5, and chroma of 3 or 4. It is sand or loamy sand. The Bw horizon has hue of 7.5YR or 10YR and value and chroma of 5 or 6. It is sand or loamy sand. The 2Bt horizon has hue of 2.5YR, 5YR, 7.5YR, 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 2 to 4. It is mostly clay loam, loam, sandy clay loam, sandy loam, fine sandy loam, or very fine sandy loam; in some pedons, however, it has subhorizons of coarser or finer textures, which reflect the interbedding of the sandstone and shale.

Mahtomedi Series

The Mahtomedi series consists of very deep, excessively drained, rapidly permeable soils on stream terraces. These soils formed in sandy outwash. Slopes range from 0 to 6 percent.

Typical pedon of Mahtomedi loamy sand, 0 to 6 percent slopes, approximately 75 feet south and 50 feet east of the northwest corner of sec. 16, T. 22 N., R. 3 W.

A—0 to 4 inches; very dark brown (10YR 2/2) loamy sand, very dark grayish brown (10YR 3/2) dry; weak medium granular structure; very friable; many fine roots; about 5 percent gravel; strongly acid; clear wavy boundary.

Bw1—4 to 7 inches; dark yellowish brown (10YR 3/4) sand, pale brown (10YR 6/3) dry; weak coarse subangular blocky structure; very friable; common fine roots; about 5 percent gravel; strongly acid; clear wavy boundary.

Bw2—7 to 20 inches; dark brown (7.5YR 4/4) sand; weak fine subangular blocky structure; very friable; common fine roots; about 10 percent gravel; strongly acid; clear smooth boundary.

BC—20 to 26 inches; strong brown (7.5YR 5/6) gravelly coarse sand; single grain; loose; about 20 percent gravel; strongly acid; clear smooth boundary.

C—26 to 60 inches; light brown (7.5YR 6/4), stratified gravelly sand and very gravelly sand; single grain; loose; an average of about 30 percent gravel; moderately acid.

The thickness of the solum ranges from 20 to 36 inches. The volume of gravel ranges from 0 to 20 percent in the upper part of the solum and from 10 to 50 percent in the lower part of the solum and in the substratum. The A horizon has hue of 7.5YR or

10YR, value of 2 or 3, and chroma of 1 or 2. The Bw and BC horizons have hue of 5YR, 7.5YR, or 10YR, value of 3 to 5, and chroma of 4 to 6. The C horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 3 to 6. The Bw horizon is typically sand, coarse sand, or loamy sand, but it is the gravelly analogs of these textures in some pedons. The BC and C horizons are mainly gravelly or very gravelly sand or coarse sand.

Majik Series

The Majik series consists of very deep, somewhat poorly drained, rapidly permeable soils on stream terraces. These soils formed in siliceous sandy alluvium. Slopes range from 0 to 3 percent.

Typical pedon of Majik loamy fine sand, 0 to 3 percent slopes, approximately 200 feet north and 200 feet east of the southwest corner of sec. 5, T. 21 N., R. 5 W.

A—0 to 4 inches; very dark brown (10YR 2/2) loamy fine sand, dark grayish brown (10YR 4/2) dry; weak very fine subangular blocky structure; very friable; many very fine to coarse roots; common clean sand grains; extremely acid; abrupt wavy boundary.

E—4 to 7 inches; dark grayish brown (10YR 4/2) loamy fine sand, light brownish gray (10YR 6/2) dry; weak fine subangular blocky structure; very friable; many very fine to coarse roots; extremely acid; abrupt wavy boundary.

Bw1—7 to 14 inches; dark yellowish brown (10YR 4/4) loamy fine sand; weak medium subangular blocky structure; very friable; many very fine to coarse roots; extremely acid; clear wavy boundary.

Bw2—14 to 18 inches; yellowish brown (10YR 5/4) fine sand; weak coarse subangular blocky structure; very friable; common very fine and fine roots; common medium prominent strong brown (7.5YR 5/8) masses of iron accumulation; extremely acid; clear wavy boundary.

Bw3—18 to 23 inches; yellowish brown (10YR 5/6) fine sand; weak coarse subangular blocky structure; very friable; common very fine and fine roots; many coarse prominent strong brown (7.5YR 5/8) masses of iron accumulation; very strongly acid; clear wavy boundary.

BC—23 to 29 inches; reddish yellow (7.5YR 6/8) fine sand; single grain; loose; few very fine and fine roots; many coarse prominent red (2.5YR 4/6) masses of iron accumulation; very strongly acid; clear wavy boundary.

C—29 to 60 inches; white (10YR 8/2) fine sand; single grain; loose; common medium prominent reddish yellow (7.5YR 6/8) masses of iron accumulation; very strongly acid.

The thickness of the solum ranges from 20 to 40 inches. The volume of gravel or sandstone channers ranges from 0 to 15 percent throughout the profile. The A horizon has hue of 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 2. Some pedons have an Ap horizon, which has hue of 7.5YR or 10YR, value of 2 or 3, and chroma of 1 to 3. This horizon is loamy fine sand. The E horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 2 or 3. It is fine sand, loamy fine sand, or sand. The Bw horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 3 to 8. It is loamy fine sand, fine sand, loamy sand, or sand. The BC horizon has hue of 7.5YR or 10YR, value of 4 to 8, and chroma of 2 to 8. It is sand or fine sand. The C horizon has hue of 7.5YR or 10YR, value of 4 to 8, and chroma of 2 to 8. It is fine sand or sand.

Merimod Series

The Merimod series consists of very deep, moderately well drained soils on stream terraces and pediments (fig. 20). These soils formed in silty alluvium and in the underlying loamy alluvium, which is underlain by siliceous sandy alluvium. Permeability is moderate in the silty and loamy alluvium and rapid in the sandy alluvium. Slopes range from 0 to 3 percent.

Typical pedon of Merimod silt loam, 0 to 3 percent slopes, about 1,100 feet south and 1,600 feet east of the northwest corner of sec. 8, T. 23 N., R. 4 W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, brown (10YR 5/3) dry; moderate medium subangular blocky structure; friable; common fine and medium roots; slightly acid; clear smooth boundary.

Bt1—9 to 13 inches; dark yellowish brown (10YR 4/4) silt loam; moderate fine subangular blocky structure; friable; common very fine and fine roots; few faint dark brown (7.5YR 4/3) clay films on faces of peds; strongly acid; clear wavy boundary.

Bt2—13 to 17 inches; dark brown (7.5YR 4/4) silt loam; moderate medium subangular blocky structure; friable; common very fine and fine roots; many faint dark brown (7.5YR 4/3) clay films on faces of peds; very strongly acid; clear wavy boundary.

2Bt3—17 to 29 inches; dark brown (7.5YR 4/4) loam;

moderate medium subangular blocky structure; friable; common very fine and fine roots; many faint dark brown (7.5YR 4/3) clay films on faces of peds; very strongly acid; abrupt smooth boundary.

2Bt4—29 to 32 inches; dark yellowish brown (10YR 4/4) sandy loam; moderate medium subangular blocky structure; friable; few very fine and fine roots; common distinct dark brown (7.5YR 4/4) clay films on faces of peds; very strongly acid; abrupt wavy boundary.

3C1—32 to 52 inches; yellowish brown (10YR 5/6) sand; single grain; loose; few strata of dark yellowish brown (10YR 4/4) loamy sand (1/8 inch thick); strongly acid; clear wavy boundary.

3C2—52 to 60 inches; brownish yellow (10YR 6/6) sand; single grain; loose; common medium distinct light yellowish brown (10YR 6/4) masses of iron depletion and many coarse distinct yellowish brown (10YR 5/8) masses of iron accumulation; moderately acid.

The thickness of the silty alluvium ranges from 10 to 24 inches. The depth to siliceous sandy alluvium ranges from 25 to 40 inches. The Ap or A horizon has value of 2 or 3 and chroma of 1 to 3. Some pedons have an E horizon, which has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 2 or 3. This horizon is silt loam. The Bt horizon has hue of 7.5YR or 10YR and value of 3 or 4. The 2Bt horizon has colors like those of the Bt horizon. It is loam, sandy loam, or sandy clay loam. Some pedons have a 3Bt or 3BC horizon, which has hue of 7.5YR or 10YR and value and chroma of 4 to 6. The 3C horizon has hue of 7.5YR or 10YR, value of 5 to 8, and chroma of 3 to 8. It is sand or fine sand. Some pedons have thin strata of sandy loam, fine sandy loam, loamy sand, or loamy fine sand in the 3C horizon.

Merit Series

The Merit series consists of very deep, well drained soils on stream terraces and pediments. These soils formed in silty alluvium and in the underlying loamy alluvium, which is underlain by siliceous sandy alluvium. Permeability is moderate in the silty and loamy alluvium and rapid in the sandy alluvium. Slopes range from 0 to 6 percent.

Typical pedon of Merit silt loam, in an area of Merit-Gardenvale silt loams, 1 to 6 percent slopes, approximately 2,100 feet south and 400 feet west of the northeast corner of sec. 15, T. 22 N., R. 5 W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, brown (10YR 5/3) dry; moderate medium subangular blocky structure; friable; common fine and medium roots; very strongly acid; clear smooth boundary.

Bt1—9 to 12 inches; dark yellowish brown (10YR 4/4) silt loam; moderate fine subangular blocky structure; friable; common fine and medium roots; common faint dark yellowish brown (10YR 3/4) clay films on faces of peds; clean silt grains coating faces of peds; very strongly acid; clear wavy boundary.

2Bt2—12 to 20 inches; dark brown (7.5YR 4/4) loam; moderate medium subangular blocky structure; friable; common very fine and fine roots; common distinct dark reddish brown (5YR 3/3) clay films on faces of peds; very strongly acid; clear wavy boundary.

2Bt3—20 to 30 inches; dark brown (7.5YR 4/4) loam; moderate medium subangular blocky structure; friable; few very fine roots; common distinct dark reddish brown (5YR 3/3) clay films on faces of peds; very strongly acid; gradual wavy boundary.

3C—30 to 60 inches; strong brown (7.5YR 5/6) sand; single grain; loose; very strongly acid.

The thickness of the solum ranges from 25 to 35 inches. The Ap or A horizon has value of 2 or 3 and chroma of 1 to 3. Some pedons have an E horizon, which has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 2 or 3. It is silt loam. The Bt horizon has hue of 7.5YR or 10YR and value of 4 or 5. The 2Bt horizon has colors like those of the Bt horizon. It is loam, sandy loam, or sandy clay loam. Some pedons have a 3Bt or 3BC horizon, which has hue of 7.5YR or 10YR and value and chroma of 4 to 6. This horizon is loamy sand or sand. The 3C horizon has hue of 7.5YR or 10YR, value of 5 to 8, and chroma of 3 to 6. It is sand or fine sand. Some pedons have thin strata of sandy loam, fine sandy loam, loamy sand, or loamy fine sand in the 3C horizon.

Merrillan Series

The Merrillan series consists of somewhat poorly drained soils on pediments. These soils are moderately deep to interbedded sandstone and shale bedrock. They formed in loamy alluvium and in clayey residuum derived from the underlying interbedded sandstone and shale. Permeability is moderate or moderately rapid in the loamy alluvium, slow in the clayey residuum, and extremely slow to moderately slow in the underlying interbedded sandstone and shale. Slopes range from 0 to 3 percent.

Typical pedon of Merrillan fine sandy loam, in an area of Merrillan-Veedum complex, 0 to 3 percent

slopes, approximately 2,310 feet north and 150 feet east of the southwest corner of sec. 13, T. 22 N., R. 1 E.

Oe—0 to 1 inch; very dark grayish brown (10YR 3/2) mucky peat (hemic material, which is a mat of partially decomposed leaf and grass litter); weak thin platy structure; nonsticky; very strongly acid; abrupt wavy boundary.

A—1 to 4 inches; very dark brown (10YR 2/2) fine sandy loam, very dark grayish brown (10YR 4/2) dry; weak medium granular structure; very friable; many very fine to coarse roots; very strongly acid; abrupt smooth boundary.

E—4 to 6 inches; grayish brown (10YR 5/2) fine sandy loam, light gray (10YR 7/2) dry; weak thick platy structure; very friable; many very fine to coarse roots; very strongly acid; abrupt smooth boundary.

Bs1—6 to 10 inches; dark brown (7.5YR 3/4) fine sandy loam; moderate medium subangular blocky structure; friable; common very fine and fine roots; strongly acid; clear wavy boundary.

Bs2—10 to 15 inches; dark brown (7.5YR 4/4) fine sandy loam; moderate medium subangular blocky structure; friable; common very fine and fine roots; common fine distinct grayish brown (10YR 5/2) masses of iron accumulation; extremely acid; clear wavy boundary.

2Bt1—15 to 21 inches; pale brown (10YR 6/3) silty clay loam; moderate medium subangular blocky structure; firm; few very fine and fine roots; many faint grayish brown (10YR 5/2) clay films on faces of peds; common fine prominent strong brown (7.5YR 5/8) masses of iron accumulation; extremely acid; clear wavy boundary.

2Bt2—21 to 31 inches; light brownish gray (2.5Y 6/2) clay loam; moderate coarse subangular blocky structure; firm; few very fine roots; few faint grayish brown (2.5Y 5/2) clay films on faces of peds; common coarse prominent reddish yellow (7.5YR 6/8) masses of iron accumulation; about 8 percent sandstone channers; extremely acid; gradual wavy boundary.

2Cr—31 to 60 inches; light olive gray (5Y 6/2) and olive gray (5Y 5/2), interbedded sandstone and shale.

Thickness and depth in this paragraph are measured from the top of the mineral soil. The thickness of the solum and the depth to interbedded sandstone and shale range from 20 to 40 inches. The volume of channers and gravel ranges from 0 to 10 percent in the residuum. The depth to residuum derived from the underlying interbedded sandstone and shale ranges from 15 to 34 inches.

The O horizon has hue of 7.5YR or 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 3. The A horizon has value of 2 or 3 and chroma of 1 or 2. The E horizon has value of 4 to 6 and chroma of 2 or 3. It is fine sandy loam or sandy loam. The Bs horizon has value of 3 to 5 and chroma of 3 or 4. Some pedons have a Bhs horizon, which has value and chroma of 2 or 3. The Bs or Bhs horizon is fine sandy loam or sandy loam. The 2Bt horizon has hue of 2.5YR, 5YR, 7.5YR, 10YR, 2.5Y, or 5Y, value of 4 to 8, and chroma of 2 to 6. It is dominantly silty clay loam, clay loam, silty clay, or clay loam; in some pedons, however, it has subhorizons of coarser or finer textures, which reflect the interbedding of the sandstone and shale.

Moppet Series

The Moppet series consists of very deep, moderately well drained soils on flood plains. These soils formed in loamy alluvium overlying sandy alluvium. Permeability is moderate or moderately rapid in the loamy alluvium and rapid in the sandy alluvium. Slopes range from 0 to 3 percent.

Typical pedon of Moppet fine sandy loam, in an area of Moppet-Fordum complex, 0 to 3 percent slopes, approximately 2,600 feet north of the southwest corner of sec. 20, T. 22 N., R. 1 E.

A—0 to 4 inches; dark brown (7.5YR 3/2) fine sandy loam, pinkish gray (7.5YR 6/2) dry; weak medium subangular blocky structure; very friable; common fine and very fine roots; very strongly acid; abrupt wavy boundary.

Bw1—4 to 19 inches; dark brown (7.5YR 3/4) fine sandy loam; weak medium subangular blocky structure; very friable; common fine and very fine roots; few thin strata of loamy fine sand in the lower 4 inches; very strongly acid; clear wavy boundary.

Bw2—19 to 32 inches; strong brown (7.5YR 4/6) fine sandy loam; weak coarse subangular blocky structure; very friable; few fine and very fine roots; few fine distinct yellowish brown (10YR 5/6) masses of iron accumulation; few thin strata of pale brown (10YR 6/3) loamy fine sand; very strongly acid; gradual wavy boundary.

2C1—32 to 45 inches; strong brown (7.5YR 5/6) loamy fine sand; single grain; loose; common medium distinct strong brown (7.5YR 5/8) masses of iron accumulation; moderately acid; gradual wavy boundary.

2C2—45 to 60 inches; strong brown (7.5YR 6/6) sand; single grain; loose; common coarse distinct reddish yellow (7.5YR 6/8) masses of iron accumulation; slightly acid.

The thickness of the loamy mantle and the depth to sandy alluvium range from 24 to 40 inches. The A horizon has hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 2 or 3. The Bw horizon has hue of 5YR, 7.5YR, or 10YR, value of 3 to 5, and chroma of 4 to 6. It is mostly fine sandy loam, sandy loam, or loam in the upper part and sand, loamy sand, or loamy fine sand in the lower part. The volume of gravel in the C horizon ranges from 0 to 15 percent.

Newlang Series

The Newlang series consists of very deep, poorly drained, rapidly permeable soils on flood plains. These soils formed dominantly in siliceous sandy alluvium. Slopes range from 0 to 2 percent.

Typical pedon of Newlang muck, 0 to 2 percent slopes, approximately 1,700 feet east of the center of sec. 20, T. 21 N., R. 5 W.

Oa—0 to 3 inches; black (10YR 2/1) muck, black (10YR 2/1) dry; weak coarse granular structure; very friable; many very fine and fine roots; few clean sand grains; very strongly acid; clear wavy boundary.

A—3 to 6 inches; black (10YR 2/1) loamy sand, black (10YR 2/1) dry; weak medium granular structure; very friable; many very fine to coarse roots; many clean sand grains; extremely acid; clear wavy boundary.

Bg—6 to 22 inches; dark grayish brown (10YR 4/2) sand; weak coarse subangular blocky structure; very friable; common very fine to coarse roots; many faint very dark grayish brown (10YR 3/2) organic coatings on faces of peds; few fine prominent reddish brown (5YR 4/4) masses of iron accumulation along root channels; very strongly acid; clear wavy boundary.

C—22 to 63 inches; pale brown (10YR 6/3) sand; single grain; loose; the color is that of the uncoated sand grains; slightly acid.

Thickness in this paragraph is measured from the top of the mineral soil. The thickness of the solum ranges from 20 to 30 inches. The volume of chert gravel or sandstone channers ranges from 0 to 15 percent throughout the profile.

The O horizon has hue of 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 2. Some pedons do not have an Oa horizon. The A horizon has hue of 7.5YR, 10YR, or 2.5Y or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 2. The texture is mucky sand, mucky loamy sand, sand, or loamy sand. The Bg horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 or 2. It is sand or loamy sand. The C or Cg horizon has hue of 10YR or 2.5Y, value of 4 to 8, and chroma of 2 to 6. It is sand or loamy sand.

Northbend Series

The Northbend series consists of very deep, somewhat poorly drained soils on flood plains along rivers and large streams. These soils formed in mostly silty and loamy alluvium and in the underlying sandy alluvium. Permeability is moderate or moderately rapid in the silty and loamy alluvium and rapid in the sandy alluvium. Slopes range from 0 to 3 percent.

Typical pedon of Northbend silt loam, in an area of Absco-Northbend complex, 0 to 3 percent slopes, approximately 700 feet south and 100 feet east of the northwest corner of sec. 20, T. 19 N., R. 5 W.

A—0 to 7 inches; dark brown (10YR 3/2) silt loam, brown (10YR 5/3) dry; weak medium granular structure; friable; many very fine, fine, and medium roots; extremely acid; abrupt irregular boundary.

Bw1—7 to 19 inches; dark brown (7.5YR 4/4) silt loam; weak medium subangular blocky structure; friable; common very fine and fine and few medium roots; few medium prominent yellowish red (5YR 5/6) masses of iron accumulation; extremely acid; clear wavy boundary.

Bw2—19 to 34 inches; dark brown (7.5YR 4/4) loam; weak medium subangular blocky structure; friable; few very fine and fine roots; few fine prominent yellowish red (5YR 5/6) masses of iron accumulation; common fine prominent light brownish gray (10YR 6/2) masses of iron depletion; few thin (less than 1/8 inch) discontinuous strata of very dark grayish brown (10YR 3/2) silt loam; extremely acid; clear wavy boundary.

2BC—34 to 36 inches; dark brown (7.5YR 4/4) loamy fine sand; weak coarse subangular blocky structure; very friable; few very fine and fine roots; common medium prominent yellowish red (5YR 5/6) masses of iron accumulation and light brownish gray (10YR 6/2) masses of iron depletion; very strongly acid; clear wavy boundary.

2C1—36 to 44 inches; brown (10YR 5/3) sand; single

grain; loose; common medium prominent yellowish red (5YR 5/6) masses of iron accumulation; very strongly acid; clear wavy boundary.

2C2—44 to 60 inches; very pale brown (10YR 7/4) sand; single grain; loose; common medium prominent yellowish red (5YR 5/6) masses of iron accumulation; few thin (less than 1/2 inch) discontinuous strata of dark brown (7.5YR 6/3) loamy sand; very strongly acid.

The thickness of the loamy mantle and the depth to sand range from 20 to 40 inches. The A horizon has hue of 7.5YR or 10YR and value and chroma of 2 or 3. The Bw horizon has hue of 5YR or 7.5YR and value and chroma of 3 or 4. It is typically silt loam or loam, but in some pedons it is very fine sandy loam, fine sandy loam, or sandy loam. The 2BC horizon has hue of 5YR, 7.5YR, or 10YR, value of 4 to 8, and chroma of 1 to 8. It is loamy sand or loamy fine sand. The 2C horizon has colors like those of the 2BC horizon. It is sand or fine sand. Some pedons have thin strata of finer textured material in the 2C horizon.

Orion Series

The Orion series consists of very deep, somewhat poorly drained, moderately permeable soils on flood plains. These soils formed in light colored, mostly silty alluvium overlying a buried soil with a dark A horizon. Slopes range from 0 to 3 percent.

Typical pedon of Orion silt loam, 0 to 3 percent slopes, approximately 1,040 feet south and 2,340 feet east of the northwest corner of sec. 8, T. 19 N., R. 6 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak coarse subangular blocky structure; friable; common very fine to coarse roots; slightly acid; abrupt smooth boundary.

C—8 to 32 inches; stratified dark brown (10YR 4/3) and dark grayish brown (10YR 4/2) silt loam that has thin strata of light brownish gray (10YR 6/2) very fine sand; massive breaking to thick plates along depositional strata; friable; common very fine and fine roots; few medium prominent dark reddish brown (5YR 3/4) masses of iron accumulation and few medium faint light brownish gray (10YR 6/2) masses of iron depletion; neutral; abrupt smooth boundary.

Ab—32 to 40 inches; black (10YR 2/1) silt loam; common medium distinct grayish brown (10YR 5/2) mottles; weak medium subangular blocky structure breaking to very thick plates along depositional strata; friable; slightly acid; clear smooth boundary.

Cg—40 to 60 inches; light brownish gray (10YR 6/2) silt loam; massive; friable; common coarse prominent yellowish red (5YR 5/6) masses of iron accumulation; slightly acid.

The thickness of the light colored silty alluvium and the depth to the Ab horizon range from 20 to 60 inches. The Ap or A horizon has value of 3 to 6 and chroma of 2 or 3. It is mostly silt loam, but thin strata of silt, loam, very fine sandy loam, loamy very fine sand, or very fine sand are in the A horizon in some pedons. The C horizon typically has color or texture strata, or both. Individual strata have value of 3 to 5 and chroma of 2 or 3. The texture is mostly silt loam, but thin strata of silt, loam, very fine sandy loam, loamy very fine sand, or very fine sand are in most pedons. The Ab horizon has value of 2 or 3 and chroma of 1 or 2. It is silt loam or silty clay loam. Some pedons have a Bgb horizon. This horizon has colors and textures like those of the Cg horizon. The Cg horizon has hue of 10YR, 2.5Y, 5Y, 5GY, 5G, 5BG, or 5B or is neutral in hue. It has value of 4 to 6 and chroma of 0 to 2. It is typically silt loam, but in some pedons it has thin strata of silt loam, very fine sandy loam, loamy very fine sand, or very fine sand.

Palms Series

The Palms series consists of very deep, very poorly drained soils on flood plains. These soils formed in organic material overlying silty or loamy deposits. Permeability is moderately slow to moderately rapid in the organic layers and moderately slow or moderate in the loamy substratum. Slopes are 0 to 1 percent.

Typical pedon of Palms muck, 0 to 1 percent slopes, approximately 300 feet south and 2,350 feet east of the northwest corner of sec. 22, T. 22 N., R. 6 W.

Oa1—0 to 4 inches; muck (sapric material), black (N 2/0) broken face and rubbed; about 70 percent fiber, about 12 percent rubbed; weak fine subangular blocky structure; nonsticky; primarily herbaceous fibers; many fine to coarse roots; strongly acid (pH 5.5 in water); clear smooth boundary.

Oa2—4 to 22 inches; muck (sapric material), black (N 2/0) broken face and rubbed; about 35 percent fiber, about 5 percent rubbed; weak medium subangular blocky structure; nonsticky; primarily herbaceous fibers; many fine to coarse roots;

moderately acid (pH 5.8 in water); clear wavy boundary.

Oa3—22 to 32 inches; muck (sapric material), black (10YR 2/1) broken face and rubbed; about 75 percent fiber, about 7 percent rubbed; weak thick platy structure; nonsticky; primarily herbaceous fibers; moderately acid (pH 5.8 in water); clear smooth boundary.

Oa4—32 to 40 inches; muck (sapric material), black (10YR 2/1) broken face and rubbed; about 20 percent fiber, about 3 percent rubbed; weak coarse subangular blocky structure; nonsticky; primarily herbaceous fibers; 10 to 15 percent mineral material; moderately acid (pH 5.8 in water); abrupt smooth boundary.

C—40 to 60 inches; dark gray (5Y 4/1) silt loam; massive; friable; neutral.

The thickness of the organic material ranges from 16 to 51 inches and coincides with the depth to the silty or loamy deposits. The organic material is dominantly muck, but some pedons have thin layers of mucky peat or peat. The muck has hue of 7.5YR or 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 2. The 2C horizon has hue of 10YR, 2.5Y, or 5Y, value of 3 to 7, and chroma of 1 or 2. It is silt loam, loam, or sandy loam.

Ponycreek Series

The Ponycreek series consists of very deep, poorly drained soils on stream terraces and pediments. These soils formed in siliceous sandy alluvium. Permeability is rapid or very rapid. Slopes range from 0 to 2 percent.

Typical pedon of Ponycreek muck, in an area of Ironrun-Ponycreek complex, 0 to 3 percent slopes, approximately 2,000 feet south and 400 feet west of the center of sec. 23, T. 21 N., R. 1 W.

Oa—0 to 4 inches; muck (sapric material), black (10YR 2/1) broken face and rubbed; about 10 percent fiber, 5 percent rubbed; weak medium granular structure; nonsticky; many fine roots; a few clean sand grains; very strongly acid; abrupt wavy boundary.

A—4 to 6 inches; black (10YR 2/1) mucky sand, very dark gray (10YR 3/1) dry; moderate medium subangular blocky structure; very friable; common very fine and fine roots; very strongly acid; abrupt wavy boundary.

Bg—6 to 29 inches; dark grayish brown (10YR 4/2) and grayish brown (10YR 5/2) sand; weak coarse subangular blocky structure; very friable; common very fine and fine roots; few medium prominent yellowish brown (10YR 5/8) masses of iron accumulation; strongly acid; clear irregular boundary.

C—29 to 64 inches; light yellowish brown (2.5Y 6/4) sand; single grain; loose; the color is that of the uncoated sand grains; strongly acid.

The thickness of the solum, measured from the top of the mineral soil, ranges from 20 to 36 inches. The Oa horizon has hue of 5YR, 7.5YR, or 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 2. The A horizon has hue of 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 2. The Bg horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 or 2. It is sand or coarse sand. The C or Cg horizon has hue of 10YR or 2.5Y, value of 4 to 8, and chroma of 1 to 8. It is sand or coarse sand.

Rockdam Series

The Rockdam series consists of very deep, moderately well drained soils on stream terraces and pediments. These soils formed in siliceous sandy alluvium or residuum derived from sandstone (fig. 21). Permeability is rapid or very rapid. Slopes range from 0 to 3 percent.

Typical pedon of Rockdam sand, 0 to 3 percent slopes, approximately 2,400 feet north and 1,640 feet east of the southwest corner of sec. 34, T. 20 N., R. 1 E.

Oe—0 to 1 inch; very dark grayish brown (10YR 3/2) mucky peat (hemic material, which is a mat of partially decomposed forest litter); about 60 percent fiber, 20 percent rubbed; weak thin platy structure; nonsticky; very strongly acid; abrupt wavy boundary.

A—1 to 3 inches; very dark gray (10YR 3/1) sand, gray (10YR 5/1) dry; weak fine granular structure; very friable; many fine to coarse roots; very strongly acid; abrupt smooth boundary.

E—3 to 6 inches; dark grayish brown (10YR 4/2) sand, grayish brown (10YR 5/2) dry; weak medium subangular blocky structure; very friable; many fine and medium roots; very strongly acid; abrupt wavy boundary.

Bs1—6 to 10 inches; dark brown (7.5YR 3/4) sand; weak medium and coarse subangular blocky structure; very friable; common very fine and fine roots; very strongly acid; clear wavy boundary.

Bs2—10 to 19 inches; dark brown (7.5YR 4/4) sand; weak medium subangular blocky structure; very friable; common very fine and fine roots; strongly acid; clear wavy boundary.

Bw—19 to 27 inches; yellowish brown (10YR 5/4) sand; weak coarse subangular blocky structure; very friable; few fine roots; strongly acid; clear wavy boundary.
C1—27 to 43 inches; brownish yellow (10YR 6/6) sand; single grain; loose; moderately acid; clear wavy boundary.
C2—43 to 53 inches; yellow (10YR 7/6) sand; single grain; loose; common fine prominent reddish yellow (7.5YR 6/8) masses of iron accumulation; slightly acid; clear smooth boundary.
C3—53 to 61 inches; light gray (10YR 7/2) sand; single grain; loose; common coarse distinct very pale brown (10YR 7/4) masses of iron accumulation; slightly acid.

The thickness of the solum, measured from the top of the mineral soil, ranges from 20 to 40 inches. The A horizon has hue of 7.5YR or 10YR, value of 2 or 3, and chroma of 1 to 3. The E horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 2 or 3. It is sand or coarse sand. The Bs horizon has hue of 7.5YR and value of 3 or 4. It is sand or coarse sand. The Bw or BC horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 4 to 8. It is sand or coarse sand. The C horizon has hue of 7.5YR or 10YR, value of 4 to 7, and chroma of 2 to 8. It is sand or coarse sand.

Rowley Series

The Rowley series consists of very deep, somewhat poorly drained soils on stream terraces and pediments. These soils formed dominantly in silty alluvium overlying sandy alluvium. Permeability is moderate in the silty and loamy alluvium and rapid in the sandy alluvium. Slopes range from 0 to 3 percent.

Typical pedon of Rowley silt loam, 0 to 3 percent slopes, approximately 350 feet north and 1,600 feet west of the southeast corner of sec. 25, T. 23 N., R. 5 W.

Ap—0 to 11 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; common very fine roots; neutral; abrupt smooth boundary.
Btg1—11 to 16 inches; dark grayish brown (10YR 4/2) silt loam; moderate medium subangular blocky structure; friable; common very fine roots; common faint dark brown (10YR 4/3) clay films on faces of peds; common medium prominent yellowish red (5YR 5/6) masses of iron accumulation; moderately acid; clear wavy boundary.
Btg2—16 to 26 inches; dark grayish brown (10YR 4/2) silt loam; moderate medium subangular blocky structure; friable; few very fine roots; many faint dark brown (10YR 4/3) clay films on faces of peds; many medium prominent strong brown (7.5YR 5/6 and 5/8) masses of iron accumulation and many medium faint light brownish gray (10YR 6/2) masses of iron depletion; moderately acid; clear wavy boundary.
Btg3—26 to 38 inches; grayish brown (10YR 5/2) silt loam; moderate fine subangular blocky structure; friable; many faint brown (10YR 4/3) clay films on faces of peds; few fine prominent strong brown (7.5YR 5/6) masses of iron accumulation and common medium faint light gray (10YR 7/2) masses of iron depletion; moderately acid; clear wavy boundary.
2Btg4—38 to 50 inches; light brownish gray (10YR 6/2) silt loam that has strata of yellowish brown (10YR 5/6) sand; weak medium subangular blocky structure; friable; few faint brown (10YR 4/3) clay films on faces of peds; common medium prominent strong brown (7.5YR 5/6) masses of iron accumulation; moderately acid; abrupt smooth boundary.
3C—50 to 60 inches; yellowish brown (10YR 5/6) sand; single grain; loose; slightly acid.

The thickness of the solum and the depth to sandy alluvium range from 40 to 60 inches. The Ap or A horizon, if it occurs, has value of 2 or 3 and chroma of 1 to 3. The Btg or Bt horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 or 3. The 2Btg horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 to 4. It is typically stratified, dominantly with silt loam, loam, or sandy loam that has strata of coarser textured material. The 3C horizon has hue of 10YR or 2.5Y, value of 4 to 8, and chroma of 2 to 6. It is sand or fine sand.

Seaton Series

The Seaton series consists of very deep, well drained soils on uplands. These soils formed in loess. Permeability is moderate. Slopes range from 2 to 30 percent.

Typical pedon of Seaton silt loam, 6 to 12 percent slopes, eroded, approximately 1,740 feet west and 740 feet south of the center of sec. 19, T. 19 N., R. 5 W.

Ap—0 to 9 inches; dark brown (10YR 3/3) silt loam, pale brown (10YR 6/3) dry; weak medium subangular blocky structure; friable; many fine roots; common coarse and medium fragments of

dark brown (7.5YR 4/4) subsoil material; neutral; abrupt smooth boundary.

Bt1—9 to 24 inches; brown (7.5YR 4/4) silt loam; moderate fine subangular blocky structure; friable; common fine roots; many faint dark brown (7.5YR 3/4) clay films on faces of peds; slightly acid; clear wavy boundary.

Bt2—24 to 34 inches; brown (7.5YR 3/4) silt loam; moderate medium subangular blocky structure; friable; common fine roots; many faint dark brown (7.5YR 4/4) clay films on faces of peds; moderately acid; clear wavy boundary.

Bt3—34 to 46 inches; dark yellowish brown (10YR 4/4) silt loam; moderate coarse subangular blocky structure; friable; few fine roots; common distinct dark brown (7.5YR 4/4) clay films on faces of peds and in pores; common coarse prominent strong brown (7.5YR 5/8) and common coarse prominent yellowish red (5YR 5/6) relict masses of iron accumulation; moderately acid; clear wavy boundary.

C—46 to 60 inches; pale brown (10YR 6/3) silt loam; massive; friable; common coarse prominent strong brown (7.5YR 5/8) relict masses of iron accumulation; few fine roots; moderately acid.

The thickness of the solum ranges from 42 to 70 inches. The Ap or A horizon, if it occurs, has value of 2 to 4 and chroma of 2 or 3. Some pedons have an E horizon, which has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. This horizon is silt loam. The Bt horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6. The C horizon has value of 4 to 6 and chroma of 3 to 6.

Sebbo Series

The Sebbo series consists of very deep, moderately well drained soils on stream terraces and pediments. These soils formed in loamy and silty colluvium. Permeability is moderate. Slopes range from 1 to 6 percent.

Typical pedon of Sebbo loam, 1 to 6 percent slopes, approximately 2,425 feet south and 2,455 feet west of the northeast corner of sec. 9, T. 19 N., R. 5 W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) loam, pale brown (10YR 5/3) dry; weak coarse subangular blocky structure; friable; common very fine roots; moderately acid; abrupt wavy boundary.

Bt1—9 to 24 inches; dark brown (7.5YR 4/4) loam; moderate medium subangular blocky structure; friable; common very fine roots; few faint dark brown (7.5YR 3/4) clay films on faces of peds; common distinct strong brown (7.5YR 5/6), clean sand grains coating vertical faces of some peds; moderately acid; clear wavy boundary.

Bt2—24 to 32 inches; dark brown (7.5YR 4/4) loam; moderate medium subangular blocky structure; friable; few very fine roots; common faint dark brown (7.5YR 3/4) clay films on faces of peds; strongly acid; clear smooth boundary.

Bt3—32 to 38 inches; yellowish brown (10YR 5/4) loam; weak medium subangular blocky structure; friable; few very fine roots; common prominent dark brown (7.5YR 3/4) clay films on faces of peds; common medium prominent dark reddish brown (5YR 3/4) and common coarse prominent brownish yellow (10YR 6/8) masses of iron accumulation; few thin (less than 1/8 inch) strata of brownish yellow (10YR 6/8) fine sand; strongly acid; clear wavy boundary.

Bt4—38 to 44 inches; light yellowish brown (10YR 6/4) silt loam; weak coarse subangular blocky structure; friable; few very fine roots; common prominent dark brown (7.5YR 3/4) clay films on faces of peds; few fine prominent yellowish red (5YR 5/6) and common medium prominent strong brown (7.5YR 5/8) masses of iron accumulation; strongly acid; clear wavy boundary.

C—44 to 60 inches; yellowish brown (10YR 5/4) silt loam; massive; friable; common medium distinct yellowish brown (10YR 5/8) masses of iron accumulation; strongly acid.

Depth to the base of the argillic horizon ranges from 40 to more than 80 inches. The Ap horizon has value and chroma of 2 or 3. Pedons in uncultivated areas have an A horizon, which has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. Some pedons have an E horizon, which has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. This horizon is silt loam or loam. The Bt horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 3 to 8. It is silt loam or loam. The C horizon has colors and textures like those of the Bt horizon.

Sechler Series

The Sechler series consists of very deep, somewhat poorly drained soils on flood plains. These soils formed in siliceous loamy and sandy alluvium that has a high content of iron nodules. Permeability is moderate in the loamy alluvium and moderately rapid over rapid in the sandy alluvium. Slopes range from 0 to 3 percent.

Typical pedon of Sechler loam, 0 to 3 percent

slopes, approximately 100 feet west and 2,000 feet north of the southeast corner of sec. 5, T. 21 N., R. 6 W.

Ap—0 to 9 inches; black (5YR 2.5/1) loam, dark reddish brown (5YR 3/2) dry; moderate medium and fine granular structure; friable; common very fine and fine roots; about 5 percent gravel consisting entirely of extremely firm, irregular, very dusky red (2.5YR 2.5/2) iron nodules; moderately acid; clear wavy boundary.

Ac—9 to 12 inches; black (5YR 2.5/1) loam, dark reddish gray (5YR 4/2) dry; moderate medium subangular blocky structure parting to moderate medium granular; friable; common very fine and fine roots; 12 percent gravel consisting entirely of extremely firm, irregular, very dusky red (2.5YR 2.5/2) iron nodules; strongly acid; clear wavy boundary.

Bwc1—12 to 16 inches; dark reddish brown (2.5YR 2/4) very gravelly loam; moderate medium subangular blocky structure; friable; common very fine and fine roots; 48 percent gravel consisting entirely of extremely firm, irregular, very dusky red (2.5YR 2.5/2) iron nodules; very strongly acid; clear wavy boundary.

Bwc2—16 to 22 inches; reddish brown (5YR 4/3) very gravelly fine sandy loam; moderate fine subangular blocky structure; friable; common very fine and fine roots; common fine faint reddish brown (5YR 4/4) masses of iron accumulation; 42 percent gravel and 3 percent cobbles consisting entirely of extremely firm, irregular, very dusky red (2.5YR 2.5/2) iron nodules; very strongly acid; clear wavy boundary.

2Bwg—22 to 27 inches; pinkish gray (7.5YR 6/2) loamy fine sand; weak fine subangular blocky structure; very friable; few very fine roots; many medium prominent yellowish red (5YR 5/8) masses of iron accumulation; common thin (less than 1/8 inch) strata of silt loam; very strongly acid; clear wavy boundary.

2C—27 to 60 inches; very pale brown (10YR 7/3) fine sand; single grain; loose; many coarse prominent red (2.5YR 4/8) and yellowish red (5YR 5/8) masses of iron accumulation; few thin strata of reddish gray (5YR 5/2) loamy fine sand and fine sandy loam with many medium prominent dark reddish brown (2.5YR 3/4) masses of iron accumulation; very strongly acid.

The thickness of the loamy mantle and the depth to siliceous sandy alluvium range from 20 to 40 inches. The thickness of the umbric epipedon ranges from 10 to 20 inches. Coarse fragments in the loamy mantle consist entirely of irregularly shaped iron nodules. The volume of coarse fragments averages less than 35 percent in the particle-size control section but averages 35 percent or more in the cambic horizon.

The Ap or A horizon has hue of 5YR, 7.5YR, or 10YR, value of 2 or 3, and chroma of 1 or 2. The Bwc horizon has hue of 2.5YR, 5YR, or 7.5YR, value of 2.5 to 4, and chroma of 3 or 4. It is typically very gravelly loam or very gravelly silt loam in the upper part and grades to very gravelly fine sandy loam or very gravelly sandy loam in the lower part. The 2Bg or 2Bw horizon has hue of 7.5YR or 10YR, value of 4 to 7, and chroma of 2 or 3. It is loamy fine sand or loamy sand. The 2C or 2Cg horizon has hue of 7.5YR or 10YR, value of 5 to 7, and chroma of 2 to 8. It is sand or fine sand that typically has a few thin strata of finer textured material.

Silverhill Series

The Silverhill series consists of well drained soils that are deep to sandstone bedrock on bedrock-controlled pediments. These soils formed mostly in loamy colluvium over siliceous sandy residuum derived from the underlying sandstone. Permeability is moderate or moderately rapid in the loamy colluvium, rapid in the sandy residuum, and moderately slow or moderate in the sandstone. Slopes range from 1 to 6 percent.

Typical pedon of Silverhill sandy loam, in an area of Bilson-Silverhill sandy loams, 1 to 6 percent slopes, approximately 200 feet south and 1,850 feet east of the center of sec. 34, T. 24 N., R. 5 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) sandy loam, pale brown (10YR 5/3) dry; moderate medium subangular blocky structure; friable; many very fine to coarse roots; strongly acid; abrupt wavy boundary.

Bt1—8 to 14 inches; dark yellowish brown (10YR 4/4) sandy loam; moderate medium subangular blocky structure; friable; many very fine and fine roots; common distinct dark brown (7.5YR 3/4) clay films on faces of peds; moderately acid; clear wavy boundary.

Bt2—14 to 26 inches; dark brown (7.5YR 4/4) sandy loam; moderate coarse subangular blocky structure parting to moderate medium subangular blocky; friable; common very fine and fine roots; many faint dark brown (7.5YR 3/4) clay films on faces of peds; strongly acid; gradual irregular boundary.

2BC—26 to 32 inches; strong brown (7.5YR 5/6)

sand; single grain; loose; few fine roots; very strongly acid; gradual irregular boundary.

2C—32 to 50 inches; brownish yellow (10YR 6/6) sand; single grain; loose; few thin strata of dark brown (7.5YR 4/4) sandy loam; very strongly acid; gradual wavy boundary.

2Cr—50 to 60 inches; very pale brown (10YR 8/3) sandstone.

The thickness of the loamy mantle and the depth to siliceous sandy residuum range from 20 to 40 inches. The depth to sandstone ranges from 40 to 60 inches. The volume of sandstone channers ranges from 0 to 15 percent in the sandy residuum. The Ap or A horizon has hue of 7.5YR or 10YR, value of 2 or 3, and chroma of 1 to 3. Some pedons have an E horizon, which has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 2 or 3. This horizon is sandy loam or fine sandy loam. The Bt horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6. It is sandy loam or fine sandy loam. The 2BC horizon has hue of 7.5YR or 10YR, value of 4 to 7, and chroma of 4 to 6. It is loamy sand or sand. The 2C horizon has hue of 7.5YR or 10YR, value of 4 to 8, and chroma of 2 to 6. It is sand but typically has a few thin strata of loamy sand or loam.

Sooner Series

The Sooner series consists of very deep, somewhat poorly drained soils on stream terraces and pediments. These soils formed in silty alluvium and in the underlying loamy alluvium, which is underlain by siliceous sandy alluvium. Permeability is moderate in the silty and loamy alluvium and rapid or very rapid in the sandy alluvium. Slopes range from 0 to 3 percent.

Typical pedon of Sooner silt loam, 0 to 3 percent slopes, approximately 1,150 feet south and 700 feet east of the northwest corner of sec. 33, T. 23 N., R. 4 W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, brown (10YR 5/3) dry; moderate medium granular structure; friable; few fine roots; slightly acid; abrupt smooth boundary.

Bt1—9 to 15 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium and fine subangular blocky structure; friable; few fine roots; few faint brown (10YR 4/3) clay films on faces of peds; few fine faint yellowish brown (10YR 5/6) masses of iron accumulation; strongly acid; clear smooth boundary.

2Bt2—15 to 23 inches; dark yellowish brown (10YR 4/4) loam; moderate medium subangular blocky structure; friable; few fine roots; common faint brown (10YR 4/3) clay films on faces of peds; many medium distinct yellowish brown (10YR 5/6) masses of iron accumulation and many medium distinct light brownish gray (10YR 6/2) masses of iron depletion; very strongly acid; clear smooth boundary.

2Bt3—23 to 27 inches; yellowish brown (10YR 5/4) loam; moderate medium subangular blocky structure; friable; few fine roots; few faint brown (10YR 4/3) clay films on faces of peds; many medium distinct yellowish brown (10YR 5/6) masses of iron accumulation and many medium distinct light brownish gray (10YR 6/2) masses of iron depletion; strongly acid; clear smooth boundary.

2Bt4—27 to 31 inches; yellowish brown (10YR 5/4) sandy loam; weak medium subangular blocky structure; friable; few fine roots; few faint brown (10YR 4/3) clay films on faces of peds; many medium prominent strong brown (7.5YR 5/6) masses of iron accumulation and many medium distinct light brownish gray (10YR 6/2) masses of iron depletion; very strongly acid; abrupt smooth boundary.

3C—31 to 60 inches; yellowish brown (10YR 5/6) sand; single grain; loose; common coarse prominent strong brown (7.5YR 5/8) masses of iron accumulation; moderately acid.

The thickness of the silty alluvium ranges from 10 to 24 inches. The depth to siliceous sandy alluvium ranges from 25 to 40 inches. The Ap or A horizon has value of 2 or 3 and chroma of 1 or 2. The Bt horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 2 to 4. The 2Bt horizon has colors like those of the Bt horizon. It is typically loam or sandy clay loam in the upper part and grades to sandy loam in the lower part. Some pedons have a 3BC horizon or a thin 3Bt horizon. This horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 2 to 6. It is loamy sand, loamy coarse sand, sand, or coarse sand. The 3C horizon has hue of 7.5YR or 10YR, value of 4 to 8, and chroma of 2 to 6. It is sand or coarse sand and has less than 10 percent weatherable minerals.

Sparta Series

The Sparta series consists of very deep, excessively drained, rapidly permeable soils on low stream terraces. These soils formed in sandy outwash. Slopes range from 0 to 3 percent.

Typical pedon of Sparta sand, 0 to 3 percent

slopes, approximately 1,200 feet north and 1,200 feet west of the southeast corner of sec. 36, T. 19 N., R. 6 W.

Ap—0 to 8 inches; very dark brown (7.5YR 2/2) sand, dark brown (7.5YR 4/2) dry; weak coarse subangular blocky structure; very friable; common very fine and fine roots; slightly acid; abrupt irregular boundary.

A—8 to 11 inches; very dark brown (7.5YR 2/2) sand, dark brown (7.5YR 4/3) dry; weak coarse subangular blocky structure; very friable; common very fine and fine roots; slightly acid; abrupt irregular boundary.

AB—11 to 16 inches; dark brown (7.5YR 3/3) sand, dark brown (7.5YR 4/3) dry; weak coarse subangular blocky structure; very friable; common very fine and fine roots; slightly acid; abrupt irregular boundary.

Bw1—16 to 28 inches; dark brown (7.5YR 3/4) sand; weak coarse subangular blocky structure; very friable; common very fine and fine roots; moderately acid; clear smooth boundary.

Bw2—28 to 42 inches; dark yellowish brown (10YR 3/4) sand; single grain; loose; common very fine and fine roots; moderately acid; clear smooth boundary.

C—42 to 60 inches; light yellowish brown (10YR 6/4) sand; single grain; loose; slightly acid.

The A or Ap horizon has hue of 7.5YR or 10YR and value and chroma of 2 or 3. The Bw horizon has hue of 7.5YR or 10YR and value and chroma of 3 to 6. The C horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 3 to 6. The Bw and C horizons are sand or fine sand.

Tarr Series

The Tarr series consists of very deep, excessively drained, rapidly permeable soils on stream terraces and pediments. These soils formed in siliceous sandy alluvium or siliceous residuum derived from sandstone. Slopes range from 0 to 45 percent.

Typical pedon of Tarr sand, 0 to 6 percent slopes, approximately 400 feet south and 900 feet east of the northwest corner of sec. 12, T. 24 N., R. 6 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) sand, brown (10YR 5/3) dry; weak fine granular structure; very friable; common fine roots; moderately acid; abrupt smooth boundary.

Bw1—8 to 18 inches; dark brown (7.5YR 4/4) sand; single grain; loose; few fine roots; moderately acid; gradual smooth boundary.

Bw2—18 to 36 inches; strong brown (7.5YR 5/4) sand; single grain; loose; few very fine roots; moderately acid; gradual smooth boundary.

C—36 to 60 inches; yellow (10YR 7/6) sand; single grain; loose; slightly acid.

The thickness of the solum ranges from 20 to 40 inches. The volume of chert gravel or sandstone channers ranges from 0 to 5 percent throughout the pedon. The Ap horizon has value of 3 or 4 and chroma of 2 or 3. Pedons in uncultivated areas have an A horizon, which has value of 2 or 3 and chroma of 1 or 2. Some pedons have an E horizon, which has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 2 or 3. The Bw horizon has hue of 7.5YR or 10YR, value of 3 to 6, and chroma of 3 to 8. The C horizon has hue of 7.5YR or 10YR, value of 5 to 8, and chroma of 1 to 8. The E, Bw, and C horizons are sand or fine sand.

Tint Series

The Tint series consists of very deep, moderately well drained, rapidly permeable soils on stream terraces and pediments. These soils formed in siliceous sandy alluvium or siliceous residuum derived from sandstone. Slopes range from 0 to 3 percent.

Typical pedon of Tint sand, 0 to 3 percent slopes, approximately 1,980 feet south and 245 feet east of the northwest corner of sec. 5, T. 21 N., R. 5 W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) sand, brown (10YR 5/3) dry; weak coarse subangular blocky structure; very friable; many very fine and fine roots; strongly acid; abrupt wavy boundary.

Bw1—9 to 17 inches; dark yellowish brown (10YR 3/4) sand; weak medium subangular blocky structure; very friable; common very fine and fine roots; moderately acid; clear smooth boundary.

Bw2—17 to 24 inches; dark yellowish brown (10YR 4/4) sand; weak medium subangular blocky structure; very friable; few very fine and fine roots; moderately acid; clear smooth boundary.

BC—24 to 34 inches; yellowish brown (10YR 5/4) sand; single grain; loose; few very fine and fine roots; moderately acid; clear wavy boundary.

C1—34 to 38 inches; very pale brown (10YR 7/4) sand; common medium prominent reddish yellow (7.5YR 6/8) masses of iron accumulation; single grain; loose; few fine and very fine roots; slightly acid; gradual smooth boundary.

C2—38 to 60 inches; brownish yellow (10YR 6/6) sand; many medium prominent yellow (10YR 7/8)

masses of iron accumulation; single grain; loose; slightly acid.

The thickness of the solum ranges from 20 to 40 inches. The volume of gravel or sandstone channers ranges from 0 to 15 percent throughout the profile. The Ap or A horizon has value of 2 to 4 and chroma of 1 to 3. The Bw horizon has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 4 to 6. The BC horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 4 to 8. The Bw and BC horizons are sand or fine sand. The C horizon has hue of 7.5YR or 10YR, value of 5 to 8, and chroma of 2 to 8. It is sand or fine sand.

Tintson Series

The Tintson series consists of very deep, moderately well drained soils on stream terraces and pediments. These soils formed in siliceous sandy alluvium overlying loamy alluvium. Permeability is rapid in the sandy alluvium and moderate in the loamy alluvium. Slopes range from 0 to 6 percent.

Typical pedon of Tintson sand, 0 to 6 percent slopes, approximately 2,100 feet east and 350 feet north of the center of sec. 16, T. 21 N., R. 6 W.

Ap—0 to 8 inches; dark brown (10YR 3/3) sand, brown (10YR 5/3) dry; weak coarse subangular blocky structure; very friable; many very fine and fine roots; moderately acid; abrupt wavy boundary.

Bw1—8 to 14 inches; dark yellowish brown (10YR 4/4) sand; weak coarse subangular blocky structure; very friable; common very fine and fine roots; moderately acid; clear wavy boundary.

Bw2—14 to 24 inches; yellowish brown (10YR 5/4) sand; weak medium subangular blocky structure; very friable; common very fine and fine roots; moderately acid; clear wavy boundary.

BC—24 to 28 inches; yellowish brown (10YR 5/4) sand; single grain; loose; common very fine and fine roots; moderately acid; clear wavy boundary.

C1—28 to 46 inches; yellow (10YR 7/6) sand; single grain; loose; few very fine and fine roots; few medium prominent strong brown (7.5YR 5/8) masses of iron accumulation; moderately acid; abrupt smooth boundary.

2C2—46 to 60 inches; yellowish brown (10YR 5/4) loam; common medium faint very pale brown (10YR 7/3) and prominent dark reddish brown (5YR 3/2) masses of iron depletion; massive; friable; few very fine and fine roots; very strongly acid.

The thickness of the solum ranges from 20 to 40 inches. The thickness of the sandy mantle and the depth to loamy alluvium range from 40 to 60 inches. The volume of gravel or sandstone channers ranges from 0 to 5 percent throughout the profile. The Ap horizon has value of 3 or 4 and chroma of 2 or 3. Some pedons have an A horizon, which has value of 2 or 3 and chroma of 1 or 2. The Bw horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6. The BC horizon has hue of 7.5YR or 10YR, value of 5 to 7, and chroma of 3 to 8. The C horizon has hue of 7.5YR or 10YR, value of 5 to 7, and chroma of 2 to 8. The Bw, BC, and C horizons are sand or fine sand. The 2C horizon has hue of 7.5YR or 10YR, value of 4 to 8, and chroma of 2 to 8. It is sandy loam, loam, or silt loam.

Toddville Series

The Toddville series consists of very deep, moderately well drained soils on stream terraces. These soils formed dominantly in silty alluvium overlying stratified sandy alluvium. Permeability is moderate in the subsoil and rapid in the sandy alluvium. Slopes range from 0 to 3 percent.

Typical pedon of Toddville silt loam, 0 to 3 percent slopes, approximately 2,440 feet north and 40 feet west of the center of sec. 36, T. 23 N., R. 5 W.

Ap—0 to 8 inches; very dark brown (10YR 2/2) silt loam, dark grayish brown (10YR 4/2) dry; moderate medium subangular blocky structure; friable; many very fine and fine roots; neutral; abrupt wavy boundary.

A—8 to 15 inches; very dark brown (10YR 2/2) silt loam, dark grayish brown (10YR 4/2) dry; moderate coarse subangular blocky structure; friable; common very fine and fine roots; neutral; abrupt wavy boundary.

AB—15 to 17 inches; dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; moderate medium subangular blocky structure parting to moderate medium and thin platy; friable; common very fine and fine roots; slightly acid; abrupt irregular boundary.

Bt1—17 to 36 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium subangular blocky structure; friable; common very fine and fine roots; many distinct dark brown (7.5YR 4/4) clay films on faces of peds; slightly acid; clear wavy boundary.

Bt2—36 to 42 inches; brown (10YR 5/3) silt loam; weak coarse subangular blocky structure; friable; common very fine and fine roots; few faint dark

yellowish brown (10YR 4/4) clay films on faces of peds; many medium prominent yellowish red (5YR 5/6) masses of iron accumulation; moderately acid; clear wavy boundary.

2Bt3—42 to 55 inches; yellowish brown (10YR 5/4) and brown (10YR 5/3), stratified silt loam, loam, sandy loam, and sand; weak coarse subangular blocky structure; friable; few very fine roots; few faint dark yellowish brown (10YR 4/4) clay films on faces of peds; many medium distinct yellowish brown (10YR 5/8) masses of iron accumulation; moderately acid; clear wavy boundary.

3C—55 to 60 inches; brownish yellow (10YR 6/6) sand; single grain; loose; few medium prominent (7.5YR 5/8) masses of iron accumulation; few thin strata of strong brown (7.5YR 5/6) sandy loam; moderately acid.

The thickness of the silty mantle and the depth to sandy alluvium range from 40 to 60 inches. The thickness of the mollic epipedon ranges from 10 to 20 inches. The Ap or A horizon has value of 2 or 3 and chroma of 1 or 2. The AB horizon has chroma of 2 or 3. The Bt horizon has hue of 7.5YR, 10YR, or 2.5Y, value of 3 to 5, and chroma of 3 or 4. It is mostly silt loam but has subhorizons of silty clay loam in some pedons. The 2Bt horizon has hue of 7.5YR, 10YR, or 2.5Y, value of 4 or 5, and chroma of 3 or 4. It is typically stratified, dominantly with silt loam, loam, fine sandy loam, or sandy loam that has thin strata of coarser textured material. The 3C horizon has hue of 7.5YR, 10YR, or 2.5Y, value of 4 to 8, and chroma of 2 to 6. It is stratified sand or fine sand and typically has a few thin strata of finer textured material.

Urne Series

The Urne series consists of well drained soils that are moderately deep to sandstone bedrock on bedrock-controlled uplands. These soils formed in loamy residuum derived from the underlying fine grained glauconitic sandstone or in loamy colluvium and residuum. Permeability is moderate or moderately rapid in the subsoil and slow to moderate in the underlying sandstone. Slopes range from 6 to 50 percent.

Typical pedon of Urne fine sandy loam, in an area of Urne-Council complex, 25 to 50 percent slopes, approximately 700 feet south and 2,440 feet east of the northwest corner of sec. 29, T. 22 N., R. 6 W.

Oe—0 to 1 inch; very dark grayish brown (10YR 3/2) mucky peat (hemic material, which is a mat of partially decomposed forest litter); about 60 percent fiber, 25 percent rubbed; weak thin platy structure; nonsticky; very strongly acid; abrupt wavy boundary.

A—1 to 3 inches; black (10YR 2/1) fine sandy loam, very dark gray (10YR 3/1) dry; moderate medium granular structure; very friable; common very fine to coarse roots; very strongly acid; abrupt wavy boundary.

Bw1—3 to 8 inches; olive brown (2.5Y 4/4) fine sandy loam; moderate medium subangular blocky structure; friable; common very fine to medium roots; strongly acid; clear wavy boundary.

Bw2—8 to 29 inches; light olive brown (2.5Y 5/4) fine sandy loam; moderate medium subangular blocky structure; friable; common very fine and fine roots; some dark olive gray (5Y 3/2) grains of glauconite in the lower part; strongly acid; clear wavy boundary.

Bw3—29 to 37 inches; light olive brown (2.5Y 5/4) fine sandy loam; weak medium subangular blocky structure; friable; common dark olive gray (5Y 3/2) grains of glauconite; about 14 percent sandstone channers; strongly acid; clear smooth boundary.

Cr—37 to 60 inches; strata of olive brown (2.5Y 4/4) and light olive brown (2.5Y 5/6), fine grained glauconitic sandstone with common dark olive brown (5Y 3/2) grains of glauconite; few thin ($^{1}/_{8}$ inch) yellowish red (5YR 5/6) strata.

Thickness and depth in this paragraph are measured from the top of the mineral soil. The thickness of the solum and the depth to sandstone range from 20 to 40 inches. The volume of sandstone channers ranges from 0 to 5 percent in the upper part of the solum and from 0 to 20 percent in the lower part of the solum.

The O horizon has hue of 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 1 or 2. The A horizon has value of 2 or 3 and chroma of 1 or 2. Some pedons have an Ap horizon, which has value of 3 or 4 and chroma of 2 or 3. This horizon is fine sandy loam. The Bw horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 to 6. It is fine sandy loam, very fine sandy loam, loam, or sandy loam or the channery analogs of these textures.

Veedum Series

The Veedum series consists of poorly drained soils that are moderately deep to sandstone bedrock on pediments. These soils formed in silty alluvium and loamy residuum derived from the underlying interbedded sandstone and shale. Permeability is

moderate in the silty alluvium, moderately slow or moderate in the residuum, and extremely slow to moderately slow in the underlying interbedded sandstone and shale. Slopes range from 0 to 2 percent.

Typical pedon of Veedum muck, in an area of Merrillan-Veedum complex, 0 to 3 percent slopes, approximately 2,470 feet north and 30 feet east of the southwest corner of sec. 13, T. 22 N., R. 1 E.

Oa—0 to 3 inches; muck (sapric material), black (10YR 2/1) broken face and rubbed; about 20 percent fiber, 10 percent rubbed; weak coarse subangular blocky structure; nonsticky; many very fine and fine roots; very strongly acid; abrupt wavy boundary.

A—3 to 9 inches; black (10YR 2/1) silt loam, very dark grayish brown (10YR 3/2) dry; weak fine granular structure; very friable; many very fine and fine roots; very strongly acid; abrupt wavy boundary.

Bg1—9 to 17 inches; dark grayish brown (10YR 4/2) silt loam; weak medium subangular blocky structure; friable; common very fine and fine roots; common medium prominent brownish yellow (10YR 6/8) masses of iron accumulation; extremely acid; clear wavy boundary.

2Bg2—17 to 33 inches; grayish brown (10YR 5/2) clay loam; weak medium subangular blocky structure; firm; few fine roots; common medium prominent brownish yellow (10YR 6/8) masses of iron accumulation; extremely acid; gradual wavy boundary.

2Cr—33 to 60 inches; light brownish gray (10YR 6/2), interbedded sandstone and shale.

The thickness of the solum and the depth to interbedded sandstone and shale range from 20 to 40 inches. The thickness of the silty alluvium and the depth to loamy residuum range from 12 to 30 inches. The Oa horizon has hue of 10YR or is neutral in hue. It has value of 2 or 3 and chroma of 0 to 2. The A horizon has colors similar to those of the Oa horizon. Some pedons have an E horizon, which has hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 0 to 2. This horizon is silt loam. The Bg horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 or 2. The 2Bg horizon has hue of 2.5YR, 5YR, 7.5YR, 10YR, 2.5Y, or 5Y or is neutral in hue. It has value of 4 to 7 and chroma of 0 to 6. It is clay loam, silty clay loam, loam, sandy clay loam, or sandy loam. The volume of sandstone channers ranges from 0 to 15 percent in the 2Bg horizon.

Whitehall Series

The Whitehall series consists of very deep, moderately well drained soils on low stream terraces. These soils formed dominantly in silty alluvium overlying siliceous sandy alluvium. Permeability is moderate in the silty alluvium and rapid or very rapid in the sandy alluvium. Slopes range from 0 to 3 percent.

Typical pedon of Whitehall silt loam, 0 to 3 percent slopes, approximately 600 feet north and 300 feet west of the southeast corner of sec. 36, T. 20 N., R. 5 W.

Ap—0 to 9 inches; dark brown (7.5YR 3/2) silt loam, brown (7.5YR 5/2) dry; moderate medium granular structure; friable; many very fine and fine roots; strongly acid; abrupt smooth boundary.

A—9 to 12 inches; dark brown (7.5YR 3/2) silt loam, brown (7.5YR 5/2) dry; moderate coarse subangular blocky structure; friable; common very fine and fine roots; very strongly acid; abrupt wavy boundary.

Bt1—12 to 16 inches; dark brown (7.5YR 4/4) silt loam; weak coarse subangular blocky structure; friable; common very fine and fine roots; few faint dark brown (7.5YR 3/3) clay films on faces of peds; common prominent dark brown (7.5YR 3/2) silt loam coatings on faces of some peds; very strongly acid; clear wavy boundary.

Bt2—16 to 28 inches; reddish brown (5YR 4/4) silt loam; moderate medium subangular blocky structure; friable; common very fine and fine roots; many faint dark reddish brown (5YR 3/3) clay films on faces of peds; very strongly acid; clear wavy boundary.

2Bt3—28 to 32 inches; reddish brown (5YR 4/4) loam; weak medium subangular blocky structure; friable; common very fine and fine roots; common faint dark reddish brown (5YR 3/3) clay films on faces of peds; very strongly acid; clear irregular boundary.

3C—32 to 60 inches; reddish yellow (7.5YR 7/6) sand; single grain; loose; common medium distinct yellowish red (5YR 5/6) masses of iron accumulation; strongly acid.

The thickness of the silty mantle and the depth to siliceous sandy alluvium range from 20 to 40 inches. The thickness of the mollic epipedon ranges from 10 to 20 inches. The Ap or A horizon has hue of 5YR, 7.5YR, or 10YR, value of 2 or 3, and chroma of 1 to 3. At least part of the Bt horizon has hue of 2.5YR or 5YR, but hue of 7.5YR occurs in subhorizons in

some pedons. The Bt horizon has value of 3 to 5 and chroma of 4 to 8. It is mostly silt loam but has subhorizons of silty clay loam in some pedons. The 2Bt horizon has hue of 2.5YR, 5YR, 7.5YR, or 10YR, value of 4 to 8, and chroma of 3 to 8. It is loam or sandy loam. Some pedons have a 3BC or 3Bt horizon, which has hue of 5YR, 7.5YR, or 10YR, value of 4 to 8, and chroma of 3 to 8. This horizon is loamy sand, loamy coarse sand, sand, or coarse sand. The 3C horizon has colors like those of the 3BC horizon. It is sand or coarse sand. The volume of sandstone channers ranges from 0 to 15 percent in the 3B and 3C horizons.

Formation of the Soils

This section describes the geology and underlying material in Jackson County. It also relates the factors of soil formation to the soils in the county and describes the processes of soil formation.

Geology and Underlying Material

Robert N. Cheetham, Jr., geologist, Natural Resources Conservation Service, helped prepare this section.

Outcrops of rocks of Precambrian to Ordovician age occur in the area west of the Black River and in the Black River channel. The Precambrian rocks are igneous or metamorphic, principally granite, gneiss, and gabbro. The Upper Cambrian rocks are shale, siltstone, sandstone, and glauconitic sandstone. The best exposures of both Precambrian and Upper Cambrian rocks are in roadcuts, along the main streams, and on mounds and river bluffs. The numerous mounds have discontinuous slope outcrops and small ledge outcrops. In western Jackson County there are a few mound tops at elevations of 1,300 feet or more with remnants of a calcitic-dolomite cap rock of Ordovician age. Most of the Upper Cambrian outcrops are covered with loess, windblown sand, colluvium, or alluvium. The Paleozoic rocks have a low dip to the west-southwest at about 1 degree. Small-scale faulting may have occurred but is obscured by vegetative cover and extensive slopewashed sand from the sandstone formations. The total thickness of the Paleozoic rocks is more than 600 feet.

Jackson County is mostly within the Driftless Area. The soil survey party observed only a few very small areas of glacial drift and till; most of the till is in the north-central and northeastern parts of the county. These areas of glacial drift and till were too small to delineate as separate map units at the scale selected for mapping. They were included as minor components in map units that formed in nonglacial materials.

In eastern Jackson County the landscape is relatively flat, except for scattered sandstone mounds. The meltwater and streams discharging from the glacial margin formed a temporary but extensive water body known as Glacial Lake Wisconsin. Lacustrine deposits from this lake cover more than 1,800 square miles in Adams, Juneau, Monroe, Jackson, and Wood Counties. During deglaciation the lacustrine silts were mostly eroded as the Black River and its tributaries acquired their present location. The severe climate resulted in a mass wastage of the exposed Upper Cambrian sandstones and the transport by water of eroded sands. The size and shape of many sandstone mounds, then interfluves, were reduced to more symmetrical mesalike forms.

Current economic mineral resources in Jackson County are sand and gravel associated with Pleistocene deposits and reworked sands of Upper Cambrian age. These materials are used as industrial sand and construction sand and gravel. Small amounts of Upper Cambrian shale are used on town roads. Very small amounts of the Ordovician Oneota calcitic-dolomite are quarried in the southwestern part of the county.

The Jackson County Iron Company operated a taconite mine near Black River Falls from 1969 to 1983. The mine was closed because of depressed steel prices. Peat deposits are numerous but scattered, and many peat beds had been burned over by the early part of the 20th century. The thickness of the remaining peat beds ranges from a few inches to more than 15 feet. Currently, there are some areas where sphagnum moss is harvested from the peat beds.

East of the Black River are scattered lacustrine clays mixed with sand and gravel from Glacial Lake Wisconsin. Clay deposits about 8 miles north of Black River Falls once provided clay for several brickyards. Presently no clay deposits are being worked.

Factors of Soil Formation

Soil forms through processes that act on deposited or accumulated geologic material. The characteristics of the soil at any given point are determined by the physical and mineral composition of the parent material; the climate under which the soil material

has accumulated and weathered; the plant and animal life on and in the soil; the relief, or lay of the land; and the length of time that the forces of soil formation have acted on the soil material (Simonson, 1959).

Climate and vegetation are active factors of soil formation. They act on the parent material that has accumulated through the weathering or physical disintegration of rocks and slowly change it into a natural body that has genetically related horizons. The effects of climate and of plant and animal life are conditioned by relief. The parent material affects the kind of soil profile that forms and in some areas determines it almost entirely. Finally, time is needed for the transformation of the parent material into a soil. Some time is always needed for the differentiation of soil horizons. Usually, a long time is needed for the development of distinct horizons.

The factors of soil formation are so closely interrelated that few generalizations can be made regarding the effects of any one factor on soil formation unless conditions are specified for the other four.

Parent Material

Parent material is the unconsolidated mass of weathered geologic material from which a soil forms. It largely determines the chemical and mineralogical composition of the soil.

In the western part of Jackson County, the soils on ridgetops and valley slopes formed mostly in silty or loamy deposits, loess, and loamy and sandy material weathered from sandstone. Seaton soils formed in loess. Gale and La Farge soils formed mostly in loess and in the underlying sandy or loamy residuum derived from sandstone. Hixton soils formed in loamy colluvium overlying siliceous sandy residuum derived from sandstone. Boone soils formed in siliceous sandy residuum derived from the underlying sandstone. Elevasil soils formed mostly in loamy colluvium and siliceous sandy residuum derived from the underlying sandstone. Urne soils formed in loamy colluvium and loamy residuum derived from the underlying fine grained glauconitic sandstone.

Soils on foot slopes and toe slopes of valley sides and on stream terraces formed in loess or in silty, loamy, or sandy deposits. Council soils formed in loamy colluvium. Bilmod, Dunnville, Jackson, and Sooner soils formed mostly in loamy or silty alluvium overlying sandy alluvium. Gosil, Ironrun, Rockdam, and Tarr soils formed in siliceous sandy alluvium or siliceous sandy residuum derived from sandstone. Mahtomedi and Sparta soils formed in sandy outwash deposits.

Most soils on flood plains formed in recent alluvial deposits. Arenzville, Coffton, Ettrick, and Orion soils formed mostly in silty alluvium. Fordum, Kalmarville, Northbend, and Sechler soils formed mainly in loamy or silty alluvium overlying sandy alluvium. Absco soils formed in siliceous, dominantly sandy alluvium.

Most soils on uplands of low relief formed in silty, loamy, or sandy deposits and in residuum derived from the underlying interbedded sandstone and shale. Hiles and Kert are examples of the silty soils, Humbird and Merrillan are examples of the loamy soils, and Elm Lake and Ludington are examples of the sandy soils.

Climate

Climate affects soil formation through its effect on the moisture supply in the soil and on soil temperature. It affects the weathering of rocks and the alteration of the parent material through the mechanical action of freezing and thawing and the chemical action generated by the leaching of water.

Climate indirectly influences soil formation through its effect on plant and animal life. Climatic factors influence the amount, kind, and rate of plant growth, and thus they also influence the accumulation of organic matter in the soil and the level of soil fertility.

Jackson County has a cool, subhumid continental climate that favors the growth of trees and the formation of leached, acid soils with a thin, dark surface layer. Climatic differences within the county are too small to have resulted in major differences among the soils.

Wind can affect the development of soil by adding or removing fine particles of soil or organic matter. It affects the moisture content of soils by influencing the rate of evaporation. Climate can also have more localized effects. North- and east-facing slopes tend to be cooler and wetter than south- and west-facing slopes. For example, depressional areas generally have cooler temperatures for a longer part of the year than ridgetops and valley slopes.

Plant and Animal Life

Living organisms, such as plants, bacteria, fungi, insects, earthworms, and rodents, are important factors of soil formation. Earthworms, ants, and rodents continually mix the soil. They bring subsoil materials to the surface and surface materials down into lower layers. They also help to keep the soil porous, thus enhancing air and water movement. Plants obtain nutrients from the soil, incorporate them into their tissues, and later release them as

dead leaves and twigs fall to the soil surface. Bacteria and fungi decompose this organic matter. This process recycles nutrients that were leached into the lower layers of the soil and adds organic matter to the surface layer.

The influence of different kinds of vegetation on the formation of soils is shown by the differences in color between soils that formed under trees and those that formed under prairie grasses. La Farge soils, for example, formed under trees. They have a lighter colored or thinner surface layer than the soils that formed under grass, and they are generally more acid. Toddville soils formed under grass. These soils have a thick, dark surface layer. Soils that formed under grass accumulate more organic matter and retain it longer than soils that formed under trees, and this organic matter contributes to their darker color. Soils that formed where the vegetation is a mixture of trees and grasses generally have characteristics intermediate between those of woodland and grassland soils.

During the past 125 years, human activities have significantly influenced the soils by disturbing and altering the soil-forming processes. Clearing, burning, and cultivating activities have altered the original condition of many soils, and the removal of plant cover has accelerated erosion. Cultivation has often contributed to a loss of organic matter, and the use of heavy equipment has compacted the soil and reduced the rate of water infiltration.

Adding animal manure and planting alfalfa and grasses, such as bromegrass, have increased the content of nutrients and organic matter in the surface layer. The addition of lime has altered the natural acidity of the soils. The lime has not only improved plant growth but has also created a more favorable environment for soil bacteria. The increased bacterial action, in turn, has hastened decomposition of the organic matter. Adding fertilizers to the soil has increased the supply of plant nutrients.

The drainage of some soils has been improved by the construction of waterways and water-control structures. Draining wet areas has permitted the cultivation of some high-potential soils but has contributed to the loss of some valuable wetlands and a general lowering of the water table throughout the area. Some of the effects of human activities may not be evident for many years.

Relief

The ridgetops, valleys, stream terraces, and glacial lake basins of Jackson County have been formed by wind, rain, running water, and glacial meltwater. Where bedrock controls the topography, the resistance or lack of resistance of the underlying rock has determined the relief. Relief, in turn, influences soil formation by controlling drainage, runoff, and other direct or indirect effects of water, including erosion. In many places the relief of a given soil can be correlated closely with the drainage, the thickness and organic matter content of the surface layer, the thickness of the solum, and the differentiation of horizons in the soil profile.

In Jackson County, the surface layer is generally thinner and lighter colored in the more sloping soils and is successively thicker and darker in the less sloping soils and in areas where the slope changes from convex to concave. Where the slopes are more gentle, runoff is slower, and thus more water soaks into the soil. As a result, there is generally more plant growth on the more gentle slopes and more organic matter accumulates in the surface layer. Also, surface material eroded from the steep upper slopes accumulates on the lower, more gentle slopes.

Soil drainage is greatly affected by relief. Runoff water from sloping to very steep, excessively drained to well drained soils accumulates on the nearly level toe slopes and flood plains, where the soils are mostly somewhat poorly drained to very poorly drained. Drainage characteristics are generally reflected in the color, degree, and kind of mottling or gleying in the soil. The well drained Bertrand and La Farge soils are dominantly free of mottles throughout the subsoil and the upper part of the substratum. The moderately well drained Jackson and Toddville soils have mottles in the lower part of the subsoil. The somewhat poorly drained Coffton and Sooner soils are mottled throughout the subsoil. The poorly drained Elm Lake and Ettrick soils are gleyed and mottled below the surface layer.

Time

The effects of the soil-forming factors are modified by time. The longer the other soil-forming factors have interacted, the more highly developed the soils can become. Arenzville soils, for example, are relatively young soils in Jackson County. These soils have few or no genetic differences between horizons because they have not been in place long enough for the soil-forming processes to take full effect. La Farge soils are considered mature because they have well defined horizons. The soil-forming processes have been active in these soils for thousands of years.

Processes of Soil Formation

A combination of basic processes is responsible for horizon differentiation. The main processes are gains, losses, transfers, and transformations. These processes generally do not act alone, and each one can affect all soils. Some changes promote horizon differentiation, and some retard it. The nature of the soil at any given point is the net result of all changes (Simonson, 1959).

The interaction among these soil-forming processes is evident in Seaton soils. These soils are well drained because they are high on the landscape and are underlain by porous sandstone. They formed in very deep loess. The climate favored the growth of plants. Plants and animals contributed to the accumulation of organic matter and organic acids, and they mixed the soil to some extent. These processes accelerated as more and higher forms of organisms grew in the soil and produced more organic residue and acids. The decomposed organic matter darkened the surface layer of these soils.

While organic matter was being decomposed, minerals within the soil were being chemically weathered by organic acids and iron was being oxidized, giving the soil a brownish color. Percolating water moved suspended particles of clay downward. As a result, the middle part of the subsoil has more clay than other parts of the profile. The loess in the substratum, at a depth of about 4 feet, is generally unweathered and has changed little since it was deposited.

As a result of the soil-forming processes, the Seaton soils have a dark brown surface layer and have clay films with dark brown colors in the subsoil. The processes that were active in the formation of these soils include gains in organic matter in the surface layer, the movement of clay from the upper part of the profile to the subsoil, and the transformation of iron compounds in the subsoil. All of these processes are active in the soils of the county. In some soils certain processes are more active than others. To a great extent, the kind of parent material and the relief have determined the kinds of processes that are dominant in the formation of the soils.

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Glossary

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvial fan. The fanlike deposit of a stream where it issues from a gorge upon a plain or of a tributary stream near or at its junction with its main stream.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Alpha,alpha-dipyridyl. A dye that when dissolved in 1N ammonium acetate is used to detect the presence of reduced iron (Fe II) in the soil. A positive reaction indicates a type of redoximorphic feature.

Animal unit month (AUM). The amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

Aquic conditions. Current soil wetness characterized by saturation, reduction, and redoximorphic features.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Argillic horizon. A subsoil horizon characterized by an accumulation of illuvial clay.

Aspect. The direction in which a slope faces.

Association, soil. A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Back slope. The geomorphic component that forms the steepest inclined surface and principal element of many hillsides. Back slopes in profile are commonly steep, are linear, and may or may not include cliff segments.

Basal area. The area of a cross section of a tree, generally referring to the section at breast height and measured outside the bark. It is a measure of stand density, commonly expressed in square feet.

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bedrock-controlled topography. A landscape where the configuration and relief of the landforms are determined or strongly influenced by the underlying bedrock.

Blowout. A shallow depression from which all or most of the soil material has been removed by the wind. A blowout has a flat or irregular floor formed by a resistant layer or by an accumulation of pebbles or cobbles. In some blowouts the water table is exposed.

Bottom land. The normal flood plain of a stream, subject to flooding.

Breast height. An average height of 4.5 feet above the ground surface; the point on a tree where diameter measurements are ordinarily taken.

Cable yarding. A method of moving felled trees to a nearby central area for transport to a processing facility. Most cable yarding systems involve use

of a drum, a pole, and wire cables in an arrangement similar to that of a rod and reel used for fishing. To reduce friction and soil disturbance, felled trees generally are reeled in while one end is lifted or the entire log is suspended.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Channery soil material. Soil material that is, by volume, 15 to 35 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches (15 centimeters) along the longest axis. A single piece is called a channer.

Chemical treatment. Control of unwanted vegetation through the use of chemicals.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay depletions. Low-chroma zones having a low content of iron, manganese, and clay because of the chemical reduction of iron and manganese and the removal of iron, manganese, and clay. A type of redoximorphic depletion.

Clayey. General term for the soil textural classes clay, silty clay, and sandy clay.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Climax plant community. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse textured soil. Sand or loamy sand.

Cobble (or cobblestone). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Cobbly soil material. Material that is 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material has 35 to 60 percent of these rock fragments, and extremely cobbly soil material has more than 60 percent.

Colluvium. Soil material or rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex, soil. A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Concretions. Cemented bodies with crude internal symmetry organized around a point, a line, or a plane. They typically take the form of concentric layers visible to the naked eye. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up concretions. If formed in place, concretions of iron oxide or manganese oxide are generally considered a type of redoximorphic concentration.

Conservation cropping system. Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the effects of the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil. Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to compression. Terms describing consistence are defined in the "Soil Survey Manual."

Contour stripcropping. Growing crops in strips that

follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Coprogenous earth (sedimentary peat). Fecal material deposited in water by aquatic organisms.

Corrosion. Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cropping system. Growing crops according to a planned system of rotation and management practices.

Crop residue management. Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Depth, soil. Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized—*excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained,* and *very poorly drained.* These classes are defined in the "Soil Survey Manual."

Drainage, surface. Runoff, or surface flow of water, from an area.

Draw. A small stream valley that generally is more open and has broader bottom land than a ravine or gulch.

Duff. A generally firm organic layer on the surface of mineral soils. It consists of fallen plant material that is in the process of decomposition and includes everything from the litter on the surface to underlying pure humus.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Endosaturation. A type of saturation of the soil in which all horizons between the upper boundary of saturation and a depth of 2 meters are saturated.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Episaturation. A type of saturation indicating a perched water table in a soil in which saturated layers are underlain by one or more unsaturated layers within 2 meters of the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as a fire, that exposes the surface.

Escarpment. A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. Synonym: scarp.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has

the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, or clay.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist 6 to 15 inches (15 to 38 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Fluvial. Of or pertaining to rivers; produced by river action, as a fluvial plain.

Foot slope. The inclined surface at the base of a hill.

Forb. Any herbaceous plant not a grass or a sedge.

Forest cover. All trees and other woody plants (underbrush) covering the ground in a forest.

Forest type. A stand of trees similar in composition and development because of given physical and biological factors by which it may be differentiated from other stands.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Glacial drift. Pulverized and other rock material transported by glacial ice and then deposited. Also, the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash. Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

Glacial till. Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glauconite. A complex potassium-iron-silicate disseminated as green flakes or grains in marine sedimentary rocks of all ages.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 35 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water. Water filling all the unblocked pores of the material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hard bedrock. Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Head slope. A geomorphic component of side slopes of hills, mounds, valleys, and ridges. Forms the concave surface at the head of a drainageway where the flow of water converges downward toward the center.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

Hill. A natural elevation of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline; hillsides generally have slopes of more than 15 percent. The distinction between a hill and a mountain is arbitrary and is dependent on local usage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the "Soil Survey Manual." The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

Hydrologic soil groups. Refers to soils grouped according to their runoff potential. The soil properties that influence this potential are those that affect the minimum rate of water infiltration on a bare soil during periods after prolonged wetting when the soil is not frozen. These properties are depth to a seasonal high water table, the infiltration rate and permeability after prolonged wetting, and depth to a very slowly permeable layer. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff.

Igneous rock. Rock formed by solidification from a molten or partially molten state. Major varieties include plutonic and volcanic rock. Examples are andesite, basalt, and granite.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intermittent stream. A stream, or reach of a stream, that flows for prolonged periods only when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

Iron depletions. Low-chroma zones having a low content of iron and manganese oxide because of chemical reduction and removal, but having a clay content similar to that of the adjacent matrix. A type of redoximorphic depletion.

Knoll. A small, low, rounded hill rising above adjacent landforms.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loamy. General term for the soil textural classes very fine sandy loam, fine sandy loam, sandy loam, coarse sandy loam, loam, clay loam, and sandy clay loam.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by the wind.

Low strength. The soil is not strong enough to support loads.

Masses. Concentrations of substances in the soil matrix that do not have a clearly defined boundary with the surrounding soil material and cannot be removed as a discrete unit. Common compounds making up masses are calcium carbonate, gypsum or other soluble salts, iron oxide, and manganese oxide. Masses consisting of iron oxide or manganese oxide generally are considered a type of redoximorphic concentration.

Mechanical treatment. Use of mechanical equipment for seeding, brush management, and other management practices.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mesa. A broad, nearly flat topped and commonly

isolated upland mass characterized by summit widths that are more than the heights of bounding erosional scarps.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Mollic epipedon. A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Descriptive terms are as follows: abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent.* The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse,* more than 15 millimeters (about 0.6 inch).

Muck. Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value of 6.6 to 7.3. (See Reaction, soil.)

Nodules. Cemented bodies lacking visible internal structure. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up nodules. If formed in place, nodules of iron oxide or manganese oxide are considered types of redoximorphic concentrations.

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

Very low	less than 0.5 percent
Low	0.5 to 1.0 percent
Moderately low	1.0 to 2.0 percent
Moderate	2.0 to 4.0 percent
High	4.0 to 8.0 percent
Very high	more than 8.0 percent

Organic soil. A soil that contains 12 to more than 18 percent organic carbon, depending on the content of mineral materials, and is 16 or more inches thick.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affects the specified use.

Permeability. The quality of the soil that enables water or air to move downward through the profile. The rate at which a saturated soil transmits water is accepted as a measure of this quality. In soil physics, the rate is referred to as "saturated hydraulic conductivity," which is defined in the "Soil Survey Manual." In line with conventional usage in the engineering profession and with traditional usage in published soil surveys, this rate of flow continues to be expressed as "permeability." Terms describing permeability, measured in inches per hour, are as follows:

Extremely slow	0.0 to 0.01 inch
Very slow	0.01 to 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid or very rapid permeability, the soil may not adequately filter effluent from a waste disposal system.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Potential native plant community. See Climax plant community.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Ultra acid	less than 3.5
Extremely acid	3.5 to 4.4
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Redoximorphic concentrations. Nodules, concretions, soft masses, pore linings, and other features resulting from the accumulation of iron or manganese oxide. An indication of chemical reduction and oxidation resulting from saturation.

Redoximorphic depletions. Low-chroma zones from which iron and manganese oxide or a combination of iron and manganese oxide and clay has been removed. These zones are indications of the chemical reduction of iron resulting from saturation.

Redoximorphic features. Redoximorphic concentrations, redoximorphic depletions, reduced matrices, a positive reaction to alpha,alpha-dipyridyl, and other features indicating the chemical reduction and oxidation of iron and manganese compounds resulting from saturation.

Reduced matrix. A soil matrix that has low chroma in situ because of chemically reduced iron (Fe II). The chemical reduction results from nearly continuous wetness. The matrix undergoes a change in hue or chroma within 30 minutes after exposure to air as the iron is oxidized (Fe III). A type of redoximorphic feature.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Ridge. A long, narrow elevation of the land surface. Commonly, a ridge has a crest and steep sides and forms an extended upland between valleys.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral

fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Sandy. General term for the soil textural classes loamy very fine sand, loamy fine sand, loamy sand, loamy coarse sand, very fine sand, fine sand, sand, and coarse sand.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Saturation. Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shoulder slope. A geomorphic component of a side slope of a hill, mound, or ridge. It makes up the transitional, generally convex surface between a back slope and the top of a hill, mound, or ridge.

Shrink-swell (in tables). The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Silty. General term for the soil textural classes silt, silt loam, and silty clay loam.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. In this survey, classes for simple slopes are as follows:

Nearly level	0 to 2 percent
Gently sloping	2 to 6 percent
Sloping	6 to 12 percent
Moderately steep	12 to 20 percent
Steep	20 to 30 percent
Very steep	30 percent and higher

Classes for complex slopes are as follows:

Nearly level	0 to 2 percent
Undulating	2 to 6 percent
Rolling	6 to 12 percent
Hilly	12 to 20 percent
Steep	20 to 30 percent
Very steep	30 percent and higher

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soft bedrock. Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the material below the solum. The living roots and plant and animal activities are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stripcropping. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to wind erosion and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular. Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Strip cut. A method of tree harvest in which the timber is clear cut in strips, commonly 50 to 100 feet wide.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Succession. The naturally occurring replacement of one plant community by another. Shade-tolerant plant species commonly replace shade-intolerant species.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons, considered collectively. It includes all subdivisions of these horizons.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field generally is built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay.* The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material that is too thin for the specified use.

Tiers. Layers used to define the control section in the classification of organic soils. The organic material is divided into three tiers. The surface tier is the upper 12 inches, the subsurface tier is the next 24 inches, and the bottom tier is the lower 16 inches.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Upland. Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial meltwater. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Valley floor. A general term for the nearly level and gently sloping bottom surface of a valley. Component landforms include stream channels, the flood plain, and, in some areas, low terrace

surfaces that may be subject to flooding from tributary streams.

Valley slope. The sloping to very steep surface between the valley bottom and ridge.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Water bars. Smooth, shallow ditches or depressional areas that are excavated at an angle across a sloping road. They are used to reduce the downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Windthrow. The uprooting and tipping over of trees by the wind.

Tables

Table 1.--Temperature and Precipitation

(Recorded in the period 1951-81 at Blair, Wisconsin)

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days*	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January-----	22.7	1.1	11.9	47	-33	0	0.85	0.28	1.30	3	9.3
February----	29.2	6.1	17.7	52	-27	6	.84	.20	1.34	3	7.6
March-------	40.1	18.4	29.3	70	-17	43	1.91	.89	2.78	5	11.3
April-------	57.4	33.4	45.4	85	13	199	2.89	1.81	3.85	7	2.3
May---------	70.4	44.0	57.2	90	24	533	4.21	2.74	5.55	8	.0
June--------	78.8	53.7	66.3	95	35	789	4.32	2.68	5.79	8	.0
July--------	83.2	58.0	70.6	97	42	949	4.45	2.22	6.38	7	.0
August------	81.0	56.0	68.5	94	38	884	4.64	2.13	6.79	7	.0
September---	71.8	46.6	59.2	90	27	576	3.63	1.42	5.47	7	.0
October-----	60.6	36.6	48.6	84	15	305	2.36	.62	3.74	5	.1
November----	43.5	24.5	34.0	68	-5	41	1.64	.53	2.53	4	4.2
December----	28.6	10.4	19.5	54	-24	8	1.02	.48	1.47	4	9.1
Yearly:											
Average---	55.6	32.4	44.0	---	---	---	---	---	---	---	---
Extreme---	---	---	---	97	-35	---	---	---	---	---	---
Total-----	---	---	---	---	---	4,333	32.76	26.88	38.51	68	43.9

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50 degrees F).

Table 2.--Freeze Dates in Spring and Fall

(Recorded in the period 1951-81 at Blair, Wisconsin)

Probability	Temperature: 24 °F or lower	Temperature: 28 °F or lower	Temperature: 32 °F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	May 6	May 25	June 1
2 years in 10 later than--	May 1	May 18	May 27
5 years in 10 later than--	Apr. 22	May 6	May 19
First freezing temperature in fall:			
1 year in 10 earlier than--	Oct. 6	Sept. 22	Sept. 11
2 years in 10 earlier than--	Oct. 10	Sept. 26	Sept. 14
5 years in 10 earlier than--	Oct. 18	Oct. 5	Sept. 21

Table 3.--Growing Season

(Recorded in the period 1951-81 at Blair, Wisconsin)

Probability	Daily minimum temperature during growing season: Higher than 24 °F	Higher than 28 °F	Higher than 32 °F
	Days	Days	Days
9 years in 10	158	129	111
8 years in 10	165	137	116
5 years in 10	178	151	124
2 years in 10	191	165	133
1 year in 10	197	173	138

Table 4.—Acreage and Proportionate Extent of the Soils

Map symbol	Soil name	Acres	Percent
AbA	Absco loamy sand, 0 to 3 percent slopes	2,485	0.4
AcA	Absco-Northbend complex, 0 to 3 percent slopes	5,120	0.8
Ad	Adder muck, 0 to 1 percent slopes	4,166	0.7
ArA	Arenzville silt loam, 0 to 3 percent slopes	1,543	0.2
BeB	Bertrand silt loam, 1 to 6 percent slopes	1,417	0.2
BkA	Bilmod sandy loam, 0 to 3 percent slopes	4,851	0.8
BlB	Bilson sandy loam, 0 to 6 percent slopes	13,665	2.1
BnB	Bilson-Silverhill sandy loams, 1 to 6 percent slopes	4,110	0.6
BnC2	Bilson-Elevasil sandy loams, 6 to 12 percent slopes, eroded	7,744	1.2
BnD2	Bilson-Elevasil sandy loams, 12 to 20 percent slopes, eroded	1,308	0.2
BoB	Boone sand, 2 to 6 percent slopes	1,168	0.2
BoC	Boone sand, 6 to 15 percent slopes	15,589	2.4
BoF	Boone sand, 15 to 50 percent slopes	4,548	0.7
BpF	Boone-Elevasil complex, 15 to 50 percent slopes	31,060	4.9
Cd	Citypoint mucky peat, 0 to 1 percent slopes	4,187	0.7
CfA	Coffton silt loam, 0 to 3 percent slopes	2,509	0.4
CoC2	Council loam, 6 to 12 percent slopes, eroded	1,691	0.3
CpC2	Council-Bilson fine sandy loams, 6 to 12 percent slopes, eroded	2,009	0.3
CpD2	Council-Bilson fine sandy loams, 12 to 20 percent slopes, eroded	4,718	0.7
CsD2	Council and Seaton soils, 12 to 20 percent slopes, eroded	23,757	3.7
CsE	Council and Seaton soils, 20 to 30 percent slopes	4,644	0.7
Da	Dawsil mucky peat, 0 to 1 percent slopes	28,211	4.4
DuA	Dunnville sandy loam, 0 to 3 percent slopes	809	0.1
ElB	Elevasil sandy loam, 2 to 6 percent slopes	3,553	0.6
ElC2	Elevasil sandy loam, 6 to 12 percent slopes, eroded	3,804	0.6
ElD2	Elevasil sandy loam, 12 to 20 percent slopes, eroded	3,360	0.5
Eo	Elm Lake mucky sand, 0 to 2 percent slopes	4,505	0.7
Et	Ettrick silt loam, 0 to 2 percent slopes	3,797	0.6
FaA	Fairchild sand, 0 to 3 percent slopes	1,678	0.3
FeA	Fairchild-Elm Lake complex, 0 to 3 percent slopes	19,008	3.0
GaC2	Gale silt loam, 6 to 12 percent slopes, eroded	1,607	0.3
GaD2	Gale silt loam, 12 to 25 percent slopes, eroded	1,123	0.2
GoB	Gosil loamy sand, 0 to 6 percent slopes	8,765	1.4
GoC	Gosil loamy sand, 6 to 12 percent slopes	4,832	0.8
HkB	Hiles-Kert silt loams, 0 to 6 percent slopes	1,354	0.2
HnB	Hixton loam, 2 to 6 percent slopes	927	0.1
HnC2	Hixton loam, 6 to 12 percent slopes, eroded	1,727	0.3
HnD2	Hixton loam, 12 to 20 percent slopes, eroded	737	0.1
HpA	Hoop sandy loam, 0 to 3 percent slopes	994	0.2
Ht	Houghton muck, 0 to 1 percent slopes	2,877	0.4
HuB	Humbird fine sandy loam, 1 to 6 percent slopes	2,570	0.4
HxB	Humbird-Merrillan fine sandy loams, 0 to 6 percent slopes	7,000	1.1
ImA	Impact sand, 0 to 3 percent slopes	5,113	0.8
IrA	Ironrun sand, 0 to 3 percent slopes	9,861	1.5
IxA	Ironrun-Ponycreek complex, 0 to 3 percent slopes	45,967	7.2
IzB	Ironrun-Ponycreek-Arbutus complex, 0 to 6 percent slopes	586	0.1
JaA	Jackson silt loam, 0 to 2 percent slopes	538	0.1
JaB	Jackson silt loam, 2 to 6 percent slopes	1,156	0.2
Ka	Kalmarville silt loam, 0 to 1 percent slopes	5,064	0.8
KeA	Kert silt loam, 0 to 3 percent slopes	1,374	0.2
LfC2	La Farge silt loam, 4 to 12 percent slopes, eroded	3,840	0.6
LfD2	La Farge silt loam, 12 to 25 percent slopes, eroded	3,113	0.5
LsD2	La Farge-Seaton silt loams, 12 to 25 percent slopes, eroded	8,061	1.3
Lt	Loxley peat, 0 to 1 percent slopes	23,211	3.6
LuB	Ludington sand, 1 to 6 percent slopes	4,504	0.7
LxB	Ludington-Fairchild sands, 0 to 6 percent slopes	2,972	0.5
MaB	Mahtomedi loamy sand, 0 to 6 percent slopes	4,940	0.8
MbA	Majik loamy fine sand, 0 to 3 percent slopes	3,147	0.5
MmA	Merimod silt loam, 0 to 3 percent slopes	3,128	0.5
MnB	Merit silt loam, 0 to 6 percent slopes	3,078	0.5
MoB	Merit-Gardenvale silt loams, 1 to 6 percent slopes	5,350	0.8
MpA	Merrillan fine sandy loam, 0 to 3 percent slopes	9,213	1.4
MrA	Merrillan-Veedum complex, 0 to 3 percent slopes	11,265	1.8
MxA	Moppet-Fordum complex, 0 to 3 percent slopes	1,666	0.3

Table 4.—Acreage and Proportionate Extent of the Soils—Continued

Map symbol	Soil name	Acres	Percent
Ne	Newlang muck, 0 to 2 percent slopes	4,166	0.7
OrA	Orion silt loam, 0 to 3 percent slopes	1,504	0.2
Pa	Palms muck, 0 to 1 percent slopes	1,377	0.2
Pt	Pits	1,993	0.3
Pu	Ponycreek muck, 0 to 2 percent slopes	2,911	0.5
Pv	Ponycreek-Dawsil complex, 0 to 2 percent slopes	15,984	2.5
Pw	Psammaquents, nearly level	2,867	0.4
RkA	Rockdam sand, 0 to 3 percent slopes	27,394	4.3
RoA	Rowley silt loam, 0 to 3 percent slopes	437	0.1
SeB	Seaton silt loam, 2 to 6 percent slopes	6,406	1.0
SeC2	Seaton silt loam, 6 to 12 percent slopes, eroded	24,068	3.8
SmB	Sebbo loam, 1 to 6 percent slopes	4,999	0.8
SnA	Sechler loam, 0 to 3 percent slopes	1,124	0.2
SoA	Sooner silt loam, 0 to 3 percent slopes	1,904	0.3
SpA	Sparta sand, 0 to 3 percent slopes	902	0.1
TrB	Tarr sand, 0 to 6 percent slopes	65,707	10.3
TrC	Tarr sand, 6 to 15 percent slopes	13,466	2.1
TrF	Tarr sand, 15 to 45 percent slopes	4,237	0.7
TtA	Tint sand, 0 to 3 percent slopes	6,482	1.0
TuB	Tintson sand, 0 to 6 percent slopes	1,362	0.2
TwA	Toddville silt loam, 0 to 3 percent slopes	2,149	0.3
UdF	Udorthents, loamy, very steep	3,559	0.6
UfC2	Urne fine sandy loam, 6 to 12 percent slopes, eroded	1,734	0.3
UfD2	Urne fine sandy loam, 12 to 25 percent slopes, eroded	1,304	0.2
UrF	Urne-Council complex, 25 to 50 percent slopes	24,261	3.8
Vs	Veedum-Elm Lake mucks, 0 to 2 percent slopes	5,198	0.8
WmA	Whitehall silt loam, 0 to 3 percent slopes	1,198	0.2
W	Water	8,512	1.3
	Total	639,879	100.0

Table 5.--Land Capability and Yields per Acre of Crops and Pasture

(Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil)

Soil name and map symbol	Land capability	Corn	Corn silage	Soybeans	Oats	Bromegrass-alfalfa hay	Timothy-red clover hay	Kentucky bluegrass
		Bu	Tons	Bu	Bu	Tons	Tons	AUM*
AbA------------- Absco	IVs	---	---	---	---	2.8	2.8	2.0
AcA------------- Absco-Northbend	IVw	---	---	---	---	2.8	2.8	2.5
Ad-------------- Adder	Vw	---	---	---	---	---	---	1.6
ArA------------- Arenzville	IIw	135	22	45	80	5.0	---	4.8
BeB------------- Bertrand	IIe	140	23	46	75	5.3	---	4.6
BkA------------- Bilmod	IIIs	90	15	30	60	3.5	3.5	2.9
BlB------------- Bilson	IIIs	90	15	30	60	3.5	3.3	2.9
BnB------------- Bilson-Silverhill	IIIs	90	15	30	60	3.7	---	3.0
BnC2------------ Bilson-Elevasil	IIIe	80	13	26	50	3.3	---	2.6
BnD2------------ Bilson-Elevasil	IVe	70	11	22	40	2.9	---	2.2
BoB------------- Boone	IVs	45	7	15	35	2.0	---	1.1
BoC------------- Boone	VIs	40	6	13	30	1.8	---	0.9
BoF------------- Boone	VIIs	---	---	---	---	---	---	0.2
BpF------------- Boone-Elevasil	VIIe	---	---	---	---	---	---	0.8
Cd-------------- Citypoint	VIIw	---	---	---	---	---	---	1.2
CfA------------- Coffton	IIw	130	21	43	75	4.9	4.0	4.1
CoC2------------ Council	IIIe	120	20	39	65	4.5	---	3.7
CpC2------------ Council-Bilson	IIIe	105	17	33	60	3.7	---	3.2
CpD2------------ Council-Bilson	IVe	95	15	29	50	3.3	---	2.8

See footnote at end of table.

Table 5.--Land Capability and Yields per Acre of Crops and Pasture--Continued

Soil name and map symbol	Land capability	Corn	Corn silage	Soybeans	Oats	Bromegrass-alfalfa hay	Timothy-red clover hay	Kentucky bluegrass
		Bu	Tons	Bu	Bu	Tons	Tons	AUM*
CsD2------------ Council and Seaton	IVe	115	19	37	60	4.4	---	3.6
CsE------------- Council and Seaton	VIe	---	---	---	---	---	---	3.2
Da-------------- Dawsil	VIIw	---	---	---	---	---	---	1.8
DuA------------- Dunnville	IIIs	75	12	25	55	3.8	---	2.9
ElB------------- Elevasil	IIIs	85	14	28	65	4.0	---	3.2
ElC2------------ Elevasil	IIIe	75	12	25	55	3.6	---	2.8
ElD2------------ Elevasil	IVe	65	10	21	45	3.2	---	2.4
Eo-------------- Elm Lake	VIw	---	---	---	---	---	---	0.7
Et-------------- Ettrick	VIw	---	---	---	---	---	4.0	3.0
FaA------------- Fairchild	IIIw	55	9	18	40	2.1	2.2	2.5
FeA------------- Fairchild-Elm Lake	VIw	---	---	---	---	---	---	1.6
GaC2------------ Gale	IIIe	95	15	31	65	4.1	---	2.8
GaD2------------ Gale	IVe	85	14	28	55	3.8	---	2.4
GoB------------- Gosil	IVs	60	10	20	50	2.8	---	2.0
GoC------------- Gosil	IVs	55	9	18	45	2.6	---	1.8
HkB------------- Hiles-Kert	IIw	80	13	27	70	3.8	3.0	2.7
HnB------------- Hixton	IIe	90	15	30	65	3.9	---	3.1
HnC2------------ Hixton	IIIe	80	13	26	55	3.5	---	2.7
HnD2------------ Hixton	IVe	70	11	23	45	3.1	---	2.3

See footnote at end of table.

Table 5.--Land Capability and Yields per Acre of Crops and Pasture--Continued

Soil name and map symbol	Land capability	Corn	Corn silage	Soybeans	Oats	Bromegrass-alfalfa hay	Timothy-red clover hay	Kentucky bluegrass
		Bu	Tons	Bu	Bu	Tons	Tons	AUM*
HpA-------------Hoop	IIIw	105	17	35	65	4.2	3.3	3.4
Ht--------------Houghton	VIIIw	135	23	---	---	---	---	5.0
HuB-------------Humbird	IIe	55	9	18	65	2.5	---	1.9
HxB-------------Humbird-Merrillan	IIw	60	10	19	60	2.7	---	1.9
ImA-------------Impact	IVs	60	10	20	50	2.6	---	1.9
IrA-------------Ironrun	IVw	50	8	---	45	1.8	2.0	1.2
IxA-------------Ironrun-Ponycreek	VIw	---	---	---	---	---	---	1.2
IzB-------------Ironrun-Ponycreek-Arbutus	VIw	---	---	---	---	---	---	1.2
JaA-------------Jackson	I	145	24	48	80	5.5	---	4.7
JaB-------------Jackson	IIe	140	23	46	75	5.3	---	5.0
Ka--------------Kalmarville	Vw	---	---	---	---	---	---	3.0
KeA-------------Kert	IIw	75	12	25	65	3.5	3.0	2.7
LfC2------------La Farge	IIIe	100	16	33	65	3.8	---	3.2
LfD2------------La Farge	IVe	95	15	29	55	3.4	---	2.8
LsD2------------La Farge-Seaton	IVe	105	17	34	60	4.0	---	3.3
Lt--------------Loxley	VIIw	---	---	---	---	---	---	3.3
LuB-------------Ludington	IVs	55	9	18	45	2.1	---	1.3
LxB-------------Ludington-Fairchild	IVs	55	9	18	45	2.1	---	1.8
MaB-------------Mahtomedi	IVs	40	6	13	40	2.2	---	1.5

See footnote at end of table.

Table 5.--Land Capability and Yields per Acre of Crops and Pasture--Continued

Soil name and map symbol	Land capability	Corn	Corn silage	Soybeans	Oats	Bromegrass-alfalfa hay	Timothy-red clover hay	Kentucky bluegrass
		Bu	Tons	Bu	Bu	Tons	Tons	AUM*
MbA------------- Majik	IVw	55	9	18	50	2.5	2.5	2.0
MmA------------- Merimod	IIe	105	17	35	65	4.4	---	3.1
MnB------------- Merit	IIe	100	16	33	65	4.0	3.0	3.1
MoB------------- Merit-Gardenvale	IIe	105	17	32	70	4.0	---	3.1
MpA------------- Merrillan	IIw	65	10	21	60	3.0	2.4	1.9
MrA------------- Merrillan-Veedum	VIw	---	---	---	---	---	---	1.2
MxA------------- Moppet-Fordum	VIw	---	---	---	---	---	---	2.8
Ne-------------- Newlang	VIw	---	---	---	---	---	---	1.0
OrA------------- Orion	IIw	125	20	41	75	4.5	3.5	4.0
Pa-------------- Palms	Vw	---	---	---	---	---	---	3.5
Pt-------------- Pits	VIIIs	---	---	---	---	---	---	---
Pu-------------- Ponycreek	VIw	---	---	---	---	---	---	1.0
Pv-------------- Ponycreek-Dawsil	VIIw	---	---	---	---	---	---	1.3
Pw-------------- Psammaquents	VIw	---	---	---	---	---	---	---
RkA------------- Rockdam	IVs	55	9	---	55	2.5	---	1.3
RoA------------- Rowley	IIw	145	24	48	80	5.5	4.0	5.0
SeB------------- Seaton	IIe	145	24	48	85	5.5	---	4.8
SeC2------------ Seaton	IIIe	135	22	45	75	5.1	---	4.4
SmB------------- Sebbo	IIe	150	25	50	90	5.6	4.0	5.0

See footnote at end of table.

Table 5.--Land Capability and Yields per Acre of Crops and Pasture--Continued

Soil name and map symbol	Land capability	Corn	Corn silage	Soybeans	Oats	Bromegrass-alfalfa hay	Timothy-red clover hay	Kentucky bluegrass
		Bu	Tons	Bu	Bu	Tons	Tons	AUM*
SnA------------- Sechler	IIw	95	15	32	65	3.8	3.1	3.2
SoA------------- Sooner	IIw	105	17	35	60	3.7	3.2	3.1
SpA------------- Sparta	IVs	65	10	21	55	2.8	---	2.0
TrB------------- Tarr	IVs	50	8	16	45	2.3	---	1.3
TrC------------- Tarr	VIs	45	7	15	40	2.1	---	1.1
TrF------------- Tarr	VIIs	---	---	---	---	---	---	0.3
TtA------------- Tint	IVs	65	11	21	55	3.0	---	1.6
TuB------------- Tintson	IIIs	70	11	22	60	3.5	---	2.0
TwA------------- Toddville	I	150	25	50	85	5.6	---	5.0
UdF------------- Udorthents	VIIe	---	---	---	---	---	---	---
UfC2------------ Urne	IIIe	80	13	26	60	3.8	---	2.9
UfD2------------ Urne	IVe	70	12	23	50	3.4	---	2.5
UrF------------- Urne-Council	VIIe	---	---	---	---	---	---	2.2
Vs-------------- Veedum-Elm Lake	VIw	---	---	---	---	---	---	1.6
WmA------------- Whitehall	IIs	115	19	38	70	4.5	---	3.6

* Animal unit month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

Table 6.--Prime Farmland

(Only the soils considered prime farmland are listed. Urban or built-up areas of the soils listed are not considered prime farmland. If a soil is prime farmland only under certain conditions, the conditions are specified in parentheses after the soil name)

Map symbol	Soil name
ArA	Arenzville silt loam, 0 to 3 percent slopes
BeB	Bertrand silt loam, 1 to 6 percent slopes
BkA	Bilmod sandy loam, 0 to 3 percent slopes
BlB	Bilson sandy loam, 0 to 6 percent slopes
BnB	Bilson-Silverhill sandy loams, 1 to 6 percent slopes
CfA	Coffton silt loam, 0 to 3 percent slopes (where drained)
DuA	Dunnville sandy loam, 0 to 3 percent slopes
Et	Ettrick silt loam, 0 to 2 percent slopes (where drained and either protected from flooding or not frequently flooded during the growing season)
HkB	Hiles-Kert silt loams, 0 to 6 percent slopes (where drained)
HnB	Hixton loam, 2 to 6 percent slopes
HpA	Hoop sandy loam, 0 to 3 percent slopes (where drained)
JaA	Jackson silt loam, 0 to 2 percent slopes
JaB	Jackson silt loam, 2 to 6 percent slopes
KeA	Kert silt loam, 0 to 3 percent slopes (where drained)
MmA	Merimod silt loam, 0 to 3 percent slopes
MnB	Merit silt loam, 0 to 6 percent slopes
MoB	Merit-Gardenvale silt loams, 1 to 6 percent slopes
OrA	Orion silt loam, 0 to 3 percent slopes (where drained)
RoA	Rowley silt loam, 0 to 3 percent slopes (where drained)
SeB	Seaton silt loam, 2 to 6 percent slopes
SmB	Sebbo loam, 1 to 6 percent slopes
SnA	Sechler loam, 0 to 3 percent slopes (where drained)
SoA	Sooner silt loam, 0 to 3 percent slopes (where drained)
TwA	Toddville silt loam, 0 to 3 percent slopes
WmA	Whitehall silt loam, 0 to 3 percent slopes

Table 7.--Woodland Management and Productivity

(Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available)

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Seedling mortality	Windthrow hazard	Plant competition	Common trees	Site index	Volume*	
AbA------------- Absco	3S	Slight	Moderate	Slight	Slight	Black oak----------- Northern pin oak---- Eastern white pine-- Red maple----------- Eastern cottonwood--	54 --- --- --- ---	38 --- --- --- ---	Red pine, jack pine.
AcA:									
Absco-----------	3S	Slight	Moderate	Slight	Slight	Black oak----------- Northern pin oak---- Eastern white pine-- Red maple----------- Eastern cottonwood--	54 --- --- --- ---	38 --- --- --- ---	Red pine, jack pine.
Northbend------	2W	Slight	Slight	Slight	Severe	Silver maple-------- Red maple----------- American elm-------- White ash----------- Swamp white oak----- Cottonwood----------	80 --- --- --- --- ---	34 --- --- --- --- ---	Silver maple, eastern white pine, white spruce.
ArA------------- Arenzville	4A	Slight	Slight	Slight	Severe	Northern red oak---- White oak----------- Red maple----------- Eastern white pine-- Basswood------------ White ash-----------	65 --- --- --- --- ---	59 --- --- --- --- ---	Red pine, eastern white pine, white spruce, northern red oak, black walnut.
BeB------------- Bertrand	5A	Slight	Slight	Slight	Severe	Northern red oak---- White ash----------- White oak----------- Red maple----------- Black walnut-------- Basswood------------	70 --- --- --- --- ---	66 --- --- --- --- ---	Red pine, eastern white pine, white spruce, black walnut.
BkA------------- Bilmod	4A	Slight	Slight	Slight	Moderate	Northern red oak---- White oak----------- Black oak----------- Northern pin oak---- Shagbark hickory----	60 --- --- --- ---	51 --- --- --- ---	Red pine, eastern white pine, white spruce, Norway spruce.
BlB------------- Bilson	4A	Slight	Slight	Slight	Moderate	Northern red oak---- White oak----------- Black oak----------- Northern pin oak---- Shagbark hickory---- Red maple----------- White pine----------	60 --- --- --- --- --- ---	51 --- --- --- --- --- ---	Red pine, eastern white pine, white spruce, Norway spruce.
BnB:									
Bilson---------	4A	Slight	Slight	Slight	Moderate	Northern red oak---- White oak----------- Black oak----------- Northern pin oak---- Shagbark hickory----	60 --- --- --- ---	51 --- --- --- ---	Red pine, eastern white pine, white spruce, Norway spruce.

See footnote at end of table.

Table 7.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Volume*	Trees to plant
BnB:									
Silverhill	4A	Slight	Slight	Slight	Moderate	Northern red oak	63	56	Red pine, eastern white pine, white spruce, northern red oak.
						Northern pin oak	---	---	
						White oak	---	---	
						Black oak	---	---	
BnC2:									
Bilson	4A	Slight	Slight	Slight	Moderate	Northern red oak	60	51	Red pine, eastern white pine, white spruce, Norway spruce.
						White oak	---	---	
						Black oak	---	---	
						Northern pin oak	---	---	
						Shagbark hickory	---	---	
Elevasil	2A	Slight	Slight	Slight	Moderate	Black oak	45	30	Jack pine, red pine.
						Jack pine	---	---	
						Northern pin oak	---	---	
						Northern red oak	---	---	
BnD2:									
Bilson	4R	Moderate	Slight	Slight	Moderate	Northern red oak	60	51	Red pine, eastern white pine, white spruce, Norway spruce.
						White oak	---	---	
						Black oak	---	---	
						Northern pin oak	---	---	
						Shagbark hickory	---	---	
Elevasil	2R	Moderate	Slight	Slight	Moderate	Black oak	45	30	Jack pine, red pine.
						Jack pine	---	---	
						Northern pin oak	---	---	
						Northern red oak	---	---	
BoB, BoC Boone	2A	Slight	Moderate	Slight	Slight	Black oak	44	29	Red pine, jack pine.
						White oak	---	---	
						Jack pine	49	65	
						Eastern white pine	---	---	
						Northern pin oak	---	---	
						Red pine	---	---	
BoF Boone	2R	Moderate	Moderate	Slight	Slight	Black oak	44	29	Red pine, jack pine.
						White oak	---	---	
						Jack pine	49	65	
						Eastern white pine	---	---	
						Northern pin oak	---	---	
						Red pine	---	---	
BpF:									
Boone	2R	Moderate	Moderate	Slight	Slight	Black oak	44	29	Red pine, jack pine.
						White oak	---	---	
						Jack pine	49	65	
						Eastern white pine	---	---	
						Northern pin oak	---	---	
						Red pine	---	---	
Elevasil	2R	Moderate	Slight	Slight	Moderate	Black oak	45	30	Jack pine, red pine.
						Jack pine	---	---	
						Northern pin oak	---	---	
						Northern red oak	---	---	

See footnote at end of table.

Table 7.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordi- nation symbol	Management concerns: Erosion hazard	Seedling mortal- ity	Wind- throw hazard	Plant competi- tion	Potential productivity: Common trees	Site index	Volume*	Trees to plant
Cd: Citypoint	2W	Slight	Severe	Severe	Severe	Black spruce	15	23	---
						Tamarack	---	---	
CfA: Coffton	2W	Slight	Slight	Slight	Severe	Silver maple	90	42	White spruce, white ash, silver maple, red maple.
						Red maple	---	---	
						White ash	---	---	
						American elm	---	---	
CoC2: Council	4A	Slight	Slight	Slight	Severe	Northern red oak	66	60	Red pine, eastern white pine, white spruce, Norway spruce.
						Sugar maple	---	---	
						Red maple	---	---	
						American basswood	---	---	
						Paper birch	---	---	
						Quaking aspen	---	---	
						Black oak	---	---	
						White oak	---	---	
CpC2: Council	4A	Slight	Slight	Slight	Severe	Northern red oak	66	60	Red pine, eastern white pine, white spruce, Norway spruce.
						Sugar maple	---	---	
						Red maple	---	---	
						American basswood	---	---	
						Paper birch	---	---	
						Quaking aspen	---	---	
						Black oak	---	---	
						White oak	---	---	
Bilson	4A	Slight	Slight	Slight	Moderate	Northern red oak	60	51	Red pine, eastern white pine, white spruce, Norway spruce.
						White oak	---	---	
						Black oak	---	---	
						Northern pin oak	---	---	
						Shagbark hickory	---	---	
CpD2: Council	4R	Moderate	Slight	Slight	Severe	Northern red oak	66	60	Red pine, eastern white pine, white spruce, Norway spruce.
						Sugar maple	---	---	
						Red maple	---	---	
						American basswood	---	---	
						Paper birch	---	---	
						Quaking aspen	---	---	
						Black oak	---	---	
						White oak	---	---	
Bilson	4R	Moderate	Slight	Slight	Moderate	Northern red oak	60	51	Red pine, eastern white pine, white spruce, Norway spruce.
						White oak	---	---	
						Black oak	---	---	
						Northern pin oak	---	---	
						Shagbark hickory	---	---	
CsD2, CsE: Council	4R	Moderate	Slight	Slight	Severe	Northern red oak	66	60	Red pine, eastern white pine, white spruce, Norway spruce.
						Sugar maple	---	---	
						Red maple	---	---	
						American basswood	---	---	
						Paper birch	---	---	
						Quaking aspen	---	---	
						Black oak	---	---	
						White oak	---	---	

See footnote at end of table.

Table 7.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Management concerns: Plant competition	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Volume*	Trees to plant
CsD2, CsE:									
Seaton	5R	Moderate	Slight	Slight	Severe	Northern red oak	70	66	Black walnut, red pine, white spruce, northern whitecedar.
						Sugar maple	---	---	
						American basswood	---	---	
Da Dawsil	2W	Slight	Severe	Severe	Severe	Black spruce	15	23	---
						Tamarack	---	---	
DuA Dunnville	3A	Slight	Slight	Slight	Moderate	Northern red oak	55	42	Eastern white pine, red pine, white spruce.
						Sugar maple	---	---	
						American basswood	---	---	
ElB, ElC2 Elevasil	2A	Slight	Slight	Slight	Moderate	Black oak	45	30	Jack pine, red pine.
						Jack pine	---	---	
						Northern pin oak	---	---	
						Northern red oak	---	---	
ElD2 Elevasil	2R	Moderate	Slight	Slight	Moderate	Black oak	45	30	Jack pine, red pine.
						Jack pine	---	---	
						Northern pin oak	---	---	
						Northern red oak	---	---	
Eo Elm Lake	3W	Slight	Severe	Severe	Severe	Red maple	60	38	White spruce, red maple, white ash.
						White ash	---	---	
						Quaking aspen	---	---	
FaA Fairchild	5W	Slight	Moderate	Moderate	Moderate	Jack pine	55	77	Jack pine, red pine, eastern white pine, Norway spruce.
						Northern pin oak	---	---	
						Red maple	---	---	
						Paper birch	---	---	
FeA:									
Fairchild	5W	Slight	Moderate	Moderate	Moderate	Jack pine	55	77	Jack pine, red pine, eastern white pine, Norway spruce.
						Northern pin oak	---	---	
						Red maple	---	---	
						Paper birch	---	---	
Elm Lake	3W	Slight	Severe	Severe	Severe	Red maple	60	38	White spruce, red maple, white ash.
						White ash	---	---	
						Quaking aspen	---	---	
GaC2 Gale	5A	Slight	Slight	Slight	Severe	Northern red oak	74	66	Red pine, eastern white pine, white spruce.
						Sugar maple	---	---	
						White oak	---	---	
GaD2 Gale	5R	Moderate	Slight	Slight	Severe	Northern red oak	74	66	Red pine, eastern white pine, white spruce.
						Sugar maple	---	---	
						White oak	---	---	

See footnote at end of table.

Table 7.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Volume*	Trees to plant
GoB, GoC-------- Gosil	3A	Slight	Slight	Slight	Moderate	Northern red oak---- Northern pin oak---- Jack pine----------- Red pine------------ Eastern white pine-- Bur oak------------- White oak-----------	55 54 60 54 56 40 ---	42 38 85 85 109 26 ---	Jack pine, red pine.
HkB: Hiles----------	4L	Slight	Slight	Slight	Severe	Northern red oak---- Black oak----------- White oak----------- Sugar maple--------- American basswood--- Quaking aspen-------	65 --- --- --- --- ---	59 --- --- --- --- ---	Red pine, eastern white pine, white spruce.
Kert-----------	4W	Slight	Slight	Moderate	Severe	Northern red oak---- Sugar maple--------- Swamp white oak----- Red maple-----------	65 --- --- ---	59 --- --- ---	White spruce, eastern white pine, red pine.
HnB, HnC2------- Hixton	4A	Slight	Slight	Slight	Severe	Northern red oak---- White oak----------- Black oak----------- Red maple----------- Eastern white pine--	65 --- --- --- ---	59 --- --- --- ---	Northern whitecedar, red pine, white spruce.
HnD2------------ Hixton	4R	Moderate	Slight	Slight	Severe	Northern red oak---- White oak----------- Black oak----------- Red maple----------- Eastern white pine--	65 --- --- --- ---	59 --- --- --- ---	Northern whitecedar, red pine, white spruce.
HuB------------- Humbird	4L	Slight	Slight	Slight	Moderate	Northern red oak---- Northern pin oak---- Red maple----------- Black oak----------- Jack pine----------- Eastern white pine--	65 55 --- --- 63 ---	59 38 --- --- 91 ---	Red pine, eastern white pine, white spruce, red maple.
HxB: Humbird--------	4L	Slight	Slight	Slight	Moderate	Northern red oak---- Northern pin oak---- Red maple----------- Black oak----------- Jack pine----------- Eastern white pine--	65 55 --- --- 63 ---	59 38 --- --- 91 ---	Red pine, eastern white pine, white spruce, red maple.
Merrillan------	4W	Slight	Slight	Moderate	Moderate	Northern red oak---- Northern pin oak---- Red maple----------- Eastern white pine-- Eastern hemlock-----	60 --- --- --- ---	51 --- --- --- ---	Red pine, eastern white pine, white spruce, red maple.
ImA------------- Impact	5S	Slight	Moderate	Slight	Moderate	Jack pine----------- Northern pin oak---- Red pine------------ White oak-----------	53 --- --- ---	71 --- --- ---	Red pine, jack pine, Norway spruce.

See footnote at end of table.

Table 7.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Volume*	Trees to plant
IrA-------------Ironrun	6W	Slight	Moderate	Moderate	Moderate	Quaking aspen-------	70	81	Eastern white pine, white spruce, red pine, Norway spruce.
						Bigtooth aspen------	---	---	
						Paper birch---------	---	---	
						Red maple-----------	---	---	
						Eastern white pine--	---	---	
						Northern pin oak----	---	---	
						Jack pine-----------	---	---	
						Swamp white oak-----	---	---	
IxA:									
Ironrun--------	6W	Slight	Moderate	Moderate	Moderate	Quaking aspen-------	70	81	Eastern white pine, white spruce, red pine, Norway spruce.
						Bigtooth aspen------	---	---	
						Paper birch---------	---	---	
						Red maple-----------	---	---	
						Eastern white pine--	---	---	
						Northern pin oak----	---	---	
						Jack pine-----------	---	---	
						Swamp white oak-----	---	---	
Ponycreek------	6W	Slight	Severe	Severe	Severe	Jack pine-----------	59	84	Eastern white pine, white spruce.
						Quaking aspen-------	50	43	
						Paper birch---------	---	---	
						Eastern white pine--	---	---	
						Black ash-----------	---	---	
						Red maple-----------	---	---	
						Tamarack------------	---	---	
IzB:									
Ironrun--------	6W	Slight	Moderate	Moderate	Severe	Quaking aspen-------	70	81	Eastern white pine, white spruce, red pine, Norway spruce.
						Bigtooth aspen------	---	---	
						Paper birch---------	---	---	
						Red maple-----------	---	---	
						Eastern white pine--	---	---	
						Northern pin oak----	---	---	
						Jack pine-----------	---	---	
						Swamp white oak-----	---	---	
Ponycreek------	6W	Slight	Severe	Severe	Severe	Jack pine-----------	59	84	Eastern white pine, white spruce.
						Quaking aspen-------	50	43	
						Paper birch---------	---	---	
						Eastern white pine--	---	---	
						Black ash-----------	---	---	
						Red maple-----------	---	---	
						Tamarack------------	---	---	
Arbutus--------	2S	Slight	Moderate	Slight	Slight	Red maple-----------	56	36	Jack pine, red pine, eastern white pine.
						Quaking aspen-------	---	---	
						Paper birch---------	---	---	
						Bigtooth aspen------	---	---	
						Jack pine-----------	---	---	
						Northern pin oak----	---	---	
						Eastern white pine--	---	---	
						Black cherry--------	---	---	
JaA, JaB--------Jackson	5A	Slight	Slight	Slight	Severe	Northern red oak----	70	66	Red pine, eastern white pine, white spruce, black walnut.
						White ash-----------	---	---	
						White oak-----------	---	---	
						Bur oak-------------	---	---	
						Black walnut--------	---	---	

See footnote at end of table.

Table 7.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Management concerns: Plant competition	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Volume*	Trees to plant
KeA: Kert	4W	Slight	Slight	Moderate	Severe	Northern red oak	65	59	White spruce, eastern white pine, red pine.
						White ash	---	---	
						Swamp white oak	---	---	
						Red maple	---	---	
						Eastern white pine	---	---	
LfC2: La Farge	4A	Slight	Slight	Slight	Severe	Northern red oak	66	60	Eastern white pine, red pine.
						Red maple	---	---	
						White oak	---	---	
						Shagbark hickory	---	---	
						American basswood	---	---	
						Eastern white pine	---	---	
LfD2: La Farge	4R	Moderate	Slight	Slight	Severe	Northern red oak	66	60	Eastern white pine, red pine.
						Red maple	---	---	
						White oak	---	---	
						Shagbark hickory	---	---	
						American basswood	---	---	
						Eastern white pine	---	---	
LsD2:									
La Farge	4R	Moderate	Slight	Slight	Severe	Northern red oak	66	60	Eastern white pine, red pine.
						Red maple	---	---	
						White oak	---	---	
						Shagbark hickory	---	---	
						American basswood	---	---	
						Eastern white pine	---	---	
Seaton	5R	Moderate	Slight	Slight	Severe	Northern red oak	70	66	Black walnut, red pine, white spruce, northern whitecedar.
						Sugar maple	---	---	
						American basswood	---	---	
						Eastern white pine	---	---	
						White ash	---	---	
Lt: Loxley	2W	Slight	Severe	Severe	Severe	Black spruce	15	23	---
						Tamarack	---	---	
						Balsam fir	---	---	
LuB: Ludington	5A	Slight	Moderate	Slight	Moderate	Jack pine	55	77	Jack pine, red pine.
						Northern pin oak	---	---	
						Red maple	---	---	
						Paper birch	---	---	
LxB:									
Ludington	5A	Slight	Moderate	Slight	Moderate	Jack pine	55	77	Jack pine, red pine.
						Northern pin oak	---	---	
						Red maple	---	---	
						Paper birch	---	---	
						Eastern white pine	---	---	
Fairchild	5W	Slight	Moderate	Moderate	Moderate	Jack pine	55	77	Jack pine, red pine, eastern white pine, Norway spruce.
						Northern pin oak	---	---	
						Red maple	---	---	
						Paper birch	---	---	
						Eastern white pine	---	---	

See footnote at end of table.

Table 7.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Management concerns: Plant competition	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Volume*	Trees to plant
MaB------------- Mahtomedi	8S	Slight	Moderate	Slight	Slight	Red pine------------ Black oak----------- Jack pine----------- Eastern white pine-- Northern pin oak----	64 --- 69 59 ---	112 --- 102 118 ---	Red pine, jack pine, eastern white pine, white spruce.
MbA------------- Majik	5W	Slight	Slight	Slight	Moderate	Jack pine----------- Eastern white pine-- Northern pin oak---- Red pine------------ Paper birch--------- Quaking aspen-------	55 62 60 50 --- ---	77 127 43 75 --- ---	Jack pine, eastern white pine, red pine, balsam fir, white spruce, red maple.
MmA------------- Merimod	4A	Slight	Slight	Slight	Severe	Northern red oak---- Red maple----------- American basswood--- Eastern white pine-- White oak-----------	68 --- --- --- ---	63 --- --- --- ---	Red pine, eastern white pine, white spruce.
MnB------------- Merit	4A	Slight	Slight	Slight	Severe	Northern red oak---- Red maple----------- American basswood--- Eastern white pine-- White oak-----------	68 --- --- --- ---	63 --- --- --- ---	Red pine, eastern white pine, white spruce.
MoB:									
Merit-----------	4A	Slight	Slight	Slight	Severe	Northern red oak---- Red maple----------- American basswood--- Eastern white pine-- White oak-----------	68 --- --- --- ---	63 --- --- --- ---	Red pine, eastern white pine, white spruce.
Gardenvale-----	4A	Slight	Slight	Slight	Severe	Northern red oak---- White oak----------- Shagbark hickory---- American basswood--- Eastern white pine--	68 --- --- --- ---	63 --- --- --- ---	Red pine, white spruce, northern red oak.
MpA------------- Merrillan	4W	Slight	Slight	Moderate	Moderate	Northern red oak---- Northern pin oak---- Red maple----------- Eastern white pine-- Eastern hemlock-----	60 --- --- --- ---	51 --- --- --- ---	Red pine, eastern white pine, white spruce, red maple.
MrA:									
Merrillan------	4W	Slight	Slight	Moderate	Moderate	Northern red oak---- Northern pin oak---- Red maple----------- Eastern white pine-- Eastern hemlock-----	60 --- --- --- ---	51 --- --- --- ---	Red pine, eastern white pine, white spruce, red maple.
Veedum---------	1W	Slight	Severe	Severe	Severe	Black ash----------- Red maple----------- Quaking aspen-------	39 --- ---	20 --- ---	---

See footnote at end of table.

Table 7.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Management concerns: Plant competition	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Volume*	Trees to plant
MxA:									
Moppet---------	3L	Slight	Slight	Slight	Severe	Red maple-----------	60	38	White spruce, eastern white pine, red pine.
						Northern red oak----	---	---	
						American basswood---	---	---	
						Eastern white pine--	---	---	
Fordum---------	2W	Slight	Severe	Severe	Severe	Silver maple--------	80	34	Silver maple, red maple, green ash.
						Black ash-----------	---	---	
						White spruce--------	---	---	
Ne-------------- Newlang	6W	Slight	Severe	Severe	Severe	Eastern white pine--	50	90	Eastern white pine, white spruce.
						Quaking aspen-------	50	43	
						Paper birch---------	---	---	
OrA------------- Orion	2W	Slight	Slight	Slight	Severe	Silver maple--------	80	34	White spruce, silver maple, white ash, eastern cottonwood.
						Red maple-----------	---	---	
						White ash-----------	---	---	
						Eastern white pine--	---	---	
						Eastern cottonwood--	---	---	
Pu-------------- Ponycreek	6W	Slight	Severe	Severe	Severe	Jack pine-----------	59	84	Eastern white pine, white spruce.
						Quaking aspen-------	50	43	
						Paper birch---------	---	---	
						Eastern white pine--	---	---	
						Black ash-----------	---	---	
						Red maple-----------	---	---	
						Tamarack------------	---	---	
Pv:									
Ponycreek------	6W	Slight	Severe	Severe	Severe	Jack pine-----------	59	84	Eastern white pine, white spruce.
						Quaking aspen-------	50	43	
						Paper birch---------	---	---	
						Eastern white pine--	---	---	
						Black ash-----------	---	---	
						Red maple-----------	---	---	
						Tamarack------------	---	---	
Dawsil---------	2W	Slight	Severe	Severe	Severe	Black spruce--------	15	23	---
						Tamarack------------	---	---	
RkA------------- Rockdam	6S	Slight	Moderate	Slight	Slight	Jack pine-----------	56	78	Jack pine, red pine, eastern white pine.
						Red pine------------	52	80	
						Eastern white pine--	---	---	
						Northern pin oak----	---	---	
						White oak-----------	---	---	
RoA------------- Rowley	2A	Slight	Slight	Slight	Severe	Silver maple--------	70	25	Silver maple, white ash, white spruce.
						Red maple-----------	---	---	
						White ash-----------	---	---	
						American elm--------	---	---	
SeB, SeC2------- Seaton	5A	Slight	Slight	Slight	Severe	Northern red oak----	70	66	Black walnut, red pine, white spruce, northern whitecedar.
						Sugar maple---------	---	---	
						American basswood---	---	---	
						Eastern white pine--	---	---	

See footnote at end of table.

Table 7.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Seedling mortality	Windthrow hazard	Plant competition	Potential productivity: Common trees	Site index	Volume*	Trees to plant
SmB------------- Sebbo	4A	Slight	Slight	Slight	Severe	Northern red oak----	66	60	Red pine, eastern white pine, white spruce, Norway spruce.
						Red maple-----------	---	---	
						American basswood---	---	---	
						Paper birch---------	---	---	
						White oak-----------	---	---	
						Black oak-----------	---	---	
SoA------------- Sooner	2A	Slight	Slight	Slight	Moderate	Silver maple--------	80	34	Silver maple, red maple, white ash, green ash, white spruce.
						White ash-----------	---	---	
						Red maple-----------	---	---	
						Eastern white pine--	---	---	
SpA------------- Sparta	6S	Slight	Moderate	Slight	Slight	Jack pine-----------	56	78	Red pine, eastern white pine, jack pine.
						Northern pin oak----	---	---	
						Red pine------------	---	---	
						Eastern white pine--	---	---	
TrB, TrC-------- Tarr	6S	Slight	Moderate	Slight	Slight	Red pine------------	52	80	Red pine, eastern white pine, jack pine.
						Jack pine-----------	56	78	
						Northern pin oak----	---	---	
TrF------------- Tarr	6R	Severe	Severe	Slight	Slight	Red pine------------	52	80	Red pine, eastern white pine, jack pine.
						Jack pine-----------	56	78	
						Northern pin oak----	---	---	
TtA------------- Tint	6S	Slight	Moderate	Slight	Slight	Red pine------------	52	80	Eastern white pine, red pine, jack pine.
						Jack pine-----------	56	78	
						Northern pin oak----	---	---	
TuB------------- Tintson	6S	Slight	Moderate	Slight	Slight	Red pine------------	52	80	Eastern white pine, red pine, jack pine.
						Jack pine-----------	56	78	
						Northern pin oak----	---	---	
UfC2------------ Urne	4A	Slight	Slight	Slight	Moderate	Northern red oak----	62	54	Red pine, eastern white pine, white spruce.
						White oak-----------	---	---	
						Black oak-----------	---	---	
						Shagbark hickory----	---	---	
						White ash-----------	---	---	
UfD2------------ Urne	4R	Moderate	Slight	Slight	Moderate	Northern red oak----	62	54	Red pine, eastern white pine, white spruce.
						White oak-----------	---	---	
						Black oak-----------	---	---	
						Shagbark hickory----	---	---	
						White ash-----------	---	---	
UrF: Urne-----------	4R	Severe	Slight	Slight	Moderate	Northern red oak----	62	54	Red pine, eastern white pine, white spruce.
						White oak-----------	---	---	
						Black oak-----------	---	---	
						Shagbark hickory----	---	---	
						White ash-----------	---	---	

See footnote at end of table.

Table 7.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Management concerns: Plant competition	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Volume*	Trees to plant
UrF:									
Council----------	4R	Severe	Slight	Slight	Severe	Northern red oak----	66	60	Red pine, eastern white pine, white spruce, Norway spruce.
						Sugar maple----------	---	---	
						Red maple------------	---	---	
						American basswood---	---	---	
						Paper birch----------	---	---	
						Quaking aspen--------	---	---	
						Black oak------------	---	---	
						White oak------------	---	---	
Vs:									
Veedum----------	1W	Slight	Severe	Severe	Severe	Black ash------------	39	20	---
						Red maple------------	---	---	
						Quaking aspen--------	---	---	
Elm Lake--------	3W	Slight	Severe	Severe	Severe	Red maple------------	60	38	White spruce, red maple, black ash.
						Black ash------------	---	---	
						Quaking aspen--------	---	---	

* Volume is the yield in cubic feet per acre per year calculated at the age of culmination of mean annual increment for fully stocked natural stands.

Table 8.--Woodland Equipment Use

(Only the soils suitable for production of commercial trees are listed. Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe")

Soil name and map symbol	Ratings for the most limiting season: Logging areas and skid trails	Log landings	Haul roads	Site preparation and planting	Preferred operating season(s)
AbA: Absco	Moderate: too sandy, flooding.	Moderate: too sandy, flooding.	Moderate: too sandy, flooding.	Moderate: too sandy.	Summer, fall, winter.
AcA:					
Absco	Moderate: too sandy, flooding.	Moderate: too sandy, flooding.	Moderate: too sandy, flooding.	Moderate: too sandy.	Summer, fall, winter.
Northbend	Moderate: wetness, flooding.	Severe: wetness, flooding.	Severe: wetness, flooding.	Moderate: wetness, flooding.	Summer, fall, winter.
ArA: Arenzville	Slight	Moderate: flooding, low strength.	Moderate: flooding, low strength.	Slight	Summer, fall, winter.
BeB: Bertrand	Slight	Moderate: low strength.	Moderate: low strength.	Slight	Summer, fall, winter.
BkA: Bilmod	Slight	Slight	Slight	Slight	Year round.
BlB: Bilson	Slight	Slight	Slight	Slight	Year round.
BnB:					
Bilson	Slight	Slight	Slight	Slight	Year round.
Silverhill	Slight	Slight	Slight	Slight	Year round.
BnC2:					
Bilson	Slight	Moderate: slope.	Slight	Slight	Year round.
Elevasil	Slight	Moderate: slope.	Slight	Slight	Year round.
BnD2:					
Bilson	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Year round.
Elevasil	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Year round.
BoB: Boone	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Year round.
BoC: Boone	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.	Moderate: too sandy.	Year round.
BoF: Boone	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Year round.

Table 8.--Woodland Equipment Use--Continued

Soil name and map symbol	Ratings for the most limiting season: Logging areas and skid trails	Log landings	Haul roads	Site preparation and planting	Preferred operating season(s)
BpF:					
Boone	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Year round.
Elevasil	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Year round.
Cd: Citypoint	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Winter.
CfA: Coffton	Moderate: wetness.	Moderate: wetness, flooding, low strength.	Moderate: wetness, flooding, low strength.	Moderate: wetness.	Summer, fall, winter.
CoC2: Council	Slight	Moderate: slope.	Slight	Slight	Year round.
CpC2:					
Council	Slight	Moderate: slope.	Slight	Slight	Year round.
Bilson	Slight	Moderate: slope.	Slight	Slight	Year round.
CpD2:					
Council	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Year round.
Bilson	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Year round.
CsD2, CsE:					
Council	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Summer, fall, winter.
Seaton	Moderate: slope.	Severe: slope, low strength.	Moderate: slope, low strength.	Moderate: slope.	Summer, fall, winter.
DuA: Dunnville	Slight	Slight	Slight	Slight	Year round.
ElB: Elevasil	Slight	Slight	Slight	Slight	Year round.
ElC2: Elevasil	Slight	Moderate: slope.	Slight	Slight	Year round.
ElD2: Elevasil	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Year round.
Eo: Elm Lake	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, winter.
FaA: Fairchild	Moderate: wetness, too sandy, low strength.	Moderate: wetness, too sandy, low strength.	Moderate: wetness, too sandy, low strength.	Moderate: wetness, too sandy, low strength.	Summer, winter.

Table 8.--Woodland Equipment Use--Continued

Soil name and map symbol	Ratings for the most limiting season: Logging areas and skid trails	Log landings	Haul roads	Site preparation and planting	Preferred operating season(s)
FeA:					
Fairchild	Moderate: wetness, too sandy, low strength.	Moderate: wetness, too sandy, low strength.	Moderate: wetness, too sandy, low strength.	Moderate: wetness, too sandy, low strength.	Summer, winter.
Elm Lake	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, winter.
GaC2 Gale	Slight	Moderate: slope, low strength.	Moderate: low strength.	Slight	Summer, fall, winter.
GaD2 Gale	Moderate: slope.	Severe: slope, low strength.	Moderate: slope, low strength.	Moderate: slope.	Summer, fall, winter.
GoB Gosil	Slight	Slight	Slight	Slight	Year round.
GoC Gosil	Slight	Moderate: slope.	Slight	Slight	Year round.
HkB:					
Hiles	Severe: low strength.	Severe: low strength.	Severe: low strength.	Severe: low strength.	Summer, winter.
Kert	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter.
HnB Hixton	Slight	Moderate: low strength.	Moderate: low strength.	Slight	Summer, fall, winter.
HnC2 Hixton	Slight	Moderate: slope, low strength.	Moderate: low strength.	Slight	Summer, fall, winter.
HnD2 Hixton	Moderate: slope.	Severe: slope, low strength.	Moderate: slope, low strength.	Moderate: slope.	Summer, fall, winter.
HuB Humbird	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.
HxB:					
Humbird	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Summer, fall, winter.
Merrillan	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter.
ImA Impact	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Year round.
IrA Ironrun	Moderate: wetness, too sandy, low strength.	Moderate: wetness, too sandy, low strength.	Moderate: wetness, too sandy, low strength.	Moderate: wetness, too sandy, low strength.	Summer, winter.

Table 8.--Woodland Equipment Use--Continued

Soil name and map symbol	Logging areas and skid trails	Log landings	Haul roads	Site preparation and planting	Preferred operating season(s)
	Ratings for the most limiting season				
IxA:					
Ironrun	Moderate: wetness, too sandy, low strength.	Moderate: wetness, too sandy, low strength.	Moderate: wetness, too sandy, low strength.	Moderate: wetness, too sandy, low strength.	Summer, winter.
Ponycreek	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, winter.
IzB:					
Ironrun	Moderate: wetness, too sandy, low strength.	Moderate: wetness, too sandy, low strength.	Moderate: wetness, too sandy, low strength.	Moderate: wetness, too sandy, low strength.	Summer, winter.
Ponycreek	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Summer, winter.
Arbutus	Moderate: too sandy.	Moderate: too sandy, depth to rock.	Moderate: too sandy, depth to rock.	Moderate: too sandy.	Year round.
JaA, JaB Jackson	Slight	Moderate: low strength.	Moderate: low strength.	Slight	Summer, fall, winter.
KeA Kert	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter.
LfC2 La Farge	Slight	Moderate: slope, low strength.	Moderate: low strength.	Slight	Summer, fall, winter.
LfD2 La Farge	Moderate: slope.	Severe: slope, low strength.	Moderate: slope, low strength.	Moderate: slope.	Summer, fall, winter.
LsD2:					
La Farge	Moderate: slope.	Severe: slope, low strength.	Moderate: slope, low strength.	Moderate: slope.	Summer, fall, winter.
Seaton	Moderate: slope.	Severe: slope, low strength.	Moderate: slope, low strength.	Moderate: slope.	Summer, fall, winter.
Lt Loxley	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Winter.
LuB Ludington	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Year round.
LxB:					
Ludington	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Year round.
Fairchild	Moderate: wetness, too sandy, low strength.	Moderate: wetness, too sandy, low strength.	Moderate: wetness, too sandy, low strength.	Moderate: wetness, too sandy, low strength.	Summer, winter.

Table 8.--Woodland Equipment Use--Continued

Soil name and map symbol	Ratings for the most limiting season: Logging areas and skid trails	Log landings	Haul roads	Site preparation and planting	Preferred operating season(s)
MaB: Mahtomedi	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Year round.
MbA: Majik	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Summer, fall, winter.
MmA: Merimod	Slight	Moderate: low strength.	Moderate: low strength.	Slight	Year round.
MnB: Merit	Slight	Moderate: low strength.	Moderate: low strength.	Slight	Year round.
MoB:					
Merit	Slight	Moderate: low strength.	Moderate: low strength.	Slight	Year round.
Gardenvale	Slight	Moderate: low strength.	Moderate: low strength.	Slight	Year round.
MpA: Merrillan	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter.
MrA:					
Merrillan	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Summer, winter.
Veedum	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Winter.
MxA:					
Moppet	Moderate: low strength.	Moderate: flooding, low strength.	Moderate: flooding, low strength.	Moderate: low strength.	Summer, fall, winter.
Fordum	Severe: wetness, low strength.	Severe: wetness, flooding, low strength.	Severe: wetness, flooding, low strength.	Severe: wetness, low strength.	Winter.
Ne: Newlang	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness, flooding.	Severe: wetness.	Winter.
OrA: Orion	Moderate: wetness.	Moderate: wetness, flooding, low strength.	Moderate: wetness, low strength.	Moderate: wetness.	Summer, winter.
Pu: Ponycreek	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Winter.
Pv:					
Ponycreek	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Winter.

Table 8.--Woodland Equipment Use--Continued

Soil name and map symbol	Ratings for the most limiting season: Logging areas and skid trails	Log landings	Haul roads	Site preparation and planting	Preferred operating season(s)
Pv:					
Dawsil	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Winter.
RkA Rockdam	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Year round.
SeB Seaton	Slight	Moderate: low strength.	Moderate: low strength.	Slight	Summer, fall, winter.
SeC2 Seaton	Slight	Moderate: slope, low strength.	Moderate: low strength.	Slight	Summer, fall, winter.
SmB Sebbo	Slight	Moderate: low strength.	Moderate: low strength.	Slight	Summer, fall, winter.
SoA Sooner	Moderate: wetness.	Moderate: wetness, low strength.	Moderate: wetness, low strength.	Moderate: wetness.	Summer, winter.
SpA Sparta	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Year round.
TrB Tarr	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Year round.
TrC Tarr	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.	Moderate: too sandy.	Year round.
TrF Tarr	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Year round.
TtA Tint	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Year round.
TuB Tintson	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Year round.
UdF Udorthents	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Year round.
UfC2 Urne	Slight	Moderate: slope.	Slight	Slight	Year round.
UfD2 Urne	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Year round.
UrF:					
Urne	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Year round.
Council	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Year round.
Vs:					
Veedum	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Winter.

Table 8.--Woodland Equipment Use--Continued

Soil name and map symbol	Ratings for the most limiting season: Logging areas and skid trails	Log landings	Haul roads	Site preparation and planting	Preferred operating season(s)
Vs:					
Elm Lake----------	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Winter.

Table 9.--Forest Habitat Types

(Only the soils that are assigned to a habitat type are listed. See text for a description of the various habitat types)

Soil name and map symbol	Habitat type symbol	Dominance	Short scientific name	Nutrient regime*	Moisture regime**
AbA------------------ Absco	PVRh PVGy	Primary Secondary	Pinus/Vaccinium-Rubus Pinus/Vaccinium-Gaylussacia	P P	DM D
AcA:					
Absco	PVRh	Primary	Pinus/Vaccinium-Rubus	P	DM
Northbend	ArCi	Primary	Acer rubrum/Circaea	M-R	M
ArA------------------ Arenzville	ArCi	Primary	Acer rubrum/Circaea	M-R	M
BeB------------------ Bertrand	ArCi	Primary	Acer rubrum/Circaea	M-R	M
BkA------------------ Bilmod	ArDe-V PVCr	Primary Secondary	Acer rubrum/Desmodium (Vaccinium) Pinus/Vaccinium-Cornus	M M	D-DM D
BlB------------------ Bilson	ArDe-V PVCr	Primary Secondary	Acer rubrum/Desmodium (Vaccinium) Pinus/Vaccinium-Cornus	M M	D-DM D
BnB------------------ Bilson-Silverhill	ArDe-V	Primary	Acer rubrum/Desmodium (Vaccinium)	M	D-DM
BnC2, BnD2:					
Bilson	ArDe-V	Primary	Acer rubrum/Desmodium (Vaccinium)	M	D-DM
Elevasil	PVCr	Primary	Pinus/Vaccinium-Cornus	M	D
BoB, BoC------------- Boone	PVGy PVCr	Primary Secondary	Pinus/Vaccinium-Gaylussacia Pinus/Vaccinium-Cornus	P M	D D
BoF------------------ Boone	PVGy	Primary	Pinus/Vaccinium-Gaylussacia	P	D
BpF:					
Boone	PVGy	Primary	Pinus/Vaccinium-Gaylussacia	P	D
Elevasil	PVCr	Primary	Pinus/Vaccinium-Cornus	M	D
CfA------------------ Coffton	ArCi	Primary	Acer rubrum/Circaea	M-R	M
CoC2----------------- Council	ArCi ArDe-V	Primary Secondary	Acer rubrum/Circaea Acer rubrum/Desmodium (Vaccinium)	M-R M	M D-DM
CpC2, CpD2:					
Council	ArCi	Primary	Acer rubrum/Circaea	M-R	M
Bilson	ArDe-V	Primary	Acer rubrum/Desmodium (Vaccinium)	M	D-DM
CsD2, CsE------------ Council and Seaton	ArCi	Primary	Acer rubrum/Circaea	M-R	M
DuA------------------ Dunnville	ArDe-V PVCr	Primary Secondary	Acer rubrum/Desmodium (Vaccinium) Pinus/Vaccinium-Cornus	M M	D-DM D
ElB, ElC2, ElD2------ Elevasil	PVCr ArDe-V	Primary Secondary	Pinus/Vaccinium-Cornus Acer rubrum/Desmodium (Vaccinium)	M M	D D-DM

See footnotes at end of table.

Table 9.--Forest Habitat Types--Continued

Soil name and map symbol	Habitat type symbol	Dominance	Short scientific name	Nutrient regime*	Moisture regime**
FaA------------------ Fairchild	PVHa	Primary	Pinus/Vaccinium-Hamamelis-------------	P-M	D
	PVRh	Secondary	Pinus/Vaccinium-Rubus-----------------	P	DM
FeA:					
Fairchild-----------	PVHa	Primary	Pinus/Vaccinium-Hamamelis-------------	P-M	D
	PVRh	Secondary	Pinus/Vaccinium-Rubus-----------------	P	DM
Elm Lake.					
GaC2, GaD2----------- Gale	ArCi	Primary	Acer rubrum/Circaea-------------------	M-R	M
	ArDe-V	Secondary	Acer rubrum/Desmodium (Vaccinium)-----	M	D-DM
GoB, GoC------------- Gosil	PVHa	Primary	Pinus/Vaccinium-Hamamelis-------------	P-M	D
	PVCr	Secondary	Pinus/Vaccinium-Cornus----------------	M	D
HkB:					
Hiles---------------	ArCi	Primary	Acer rubrum/Circaea-------------------	M-R	M
Kert----------------	PVHa	Primary	Pinus/Vaccinium-Hamamelis-------------	P-M	D
HnB, HnC2, HnD2------ Hixton	ArDe-V	Primary	Acer rubrum/Desmodium (Vaccinium)-----	M	D-DM
HuB------------------ Humbird	ArDe-V	Primary	Acer rubrum/Desmodium (Vaccinium)-----	M	D-DM
	PVHa	Secondary	Pinus/Vaccinium-Hamamelis-------------	P-M	D
HxB:					
Humbird-------------	ArDe-V	Primary	Acer rubrum/Desmodium (Vaccinium)-----	M	D-DM
Merrillan-----------	PVHa	Primary	Pinus/Vaccinium-Hamamelis-------------	P-M	D
ImA------------------ Impact	PVGy	Primary	Pinus/Vaccinium-Gaylussacia-----------	P	D
	PVCr	Secondary	Pinus/Vaccinium-Cornus----------------	M	D
IrA------------------ Ironrun	PVHa	Primary	Pinus/Vaccinium-Hamamelis-------------	P-M	D
	PVRh	Secondary	Pinus/Vaccinium-Rubus-----------------	P	DM
IxA:					
Ironrun-------------	PVHa	Primary	Pinus/Vaccinium-Hamamelis-------------	P-M	D
	PVRh	Secondary	Pinus/Vaccinium-Rubus-----------------	P	DM
Ponycreek.					
IzB:					
Ironrun-------------	PVRh	Primary	Pinus/Vaccinium-Rubus-----------------	P	DM
Ponycreek.					
Arbutus-------------	PVGy	Primary	Pinus/Vaccinium-Gaylussacia-----------	P	D
JaA, JaB------------- Jackson	ArCi	Primary	Acer rubrum/Circaea-------------------	M-R	M
KeA------------------ Kert	ArCi	Primary	Acer rubrum/Circaea-------------------	M-R	M
	PVHa	Secondary	Pinus/Vaccinium-Hamamelis-------------	P-M	D
LfC2, LfD2----------- La Farge	ArCi	Primary	Acer rubrum/Circaea-------------------	M-R	M
	ArDe-V	Secondary	Acer rubrum/Desmodium (Vaccinium)-----	M	D-DM
LsD2:					
La Farge------------	ArDe-V	Primary	Acer rubrum/Desmodium (Vaccinium)-----	M	D-DM

See footnotes at end of table.

Table 9.--Forest Habitat Types--Continued

Soil name and map symbol	Habitat type symbol	Dominance	Short scientific name	Nutrient regime*	Moisture regime**
LsD2:					
Seaton	ArCi	Primary	Acer rubrum/Circaea	M-R	M
LuB	PVHa	Primary	Pinus/Vaccinium-Hamamelis	P-M	D
Ludington	PVCr	Secondary	Pinus/Vaccinium-Cornus	M	D
LxB:					
Ludington	PVHa	Primary	Pinus/Vaccinium-Hamamelis	P-M	D
Fairchild	PVRh	Primary	Pinus/Vaccinium-Rubus	P	DM
MaB	PVGy	Primary	Pinus/Vaccinium-Gaylussacia	P	D
Mahtomedi	PVCr	Secondary	Pinus/Vaccinium-Cornus	M	D
MbA	PVRh	Primary	Pinus/Vaccinium-Rubus	P	DM
Majik					
MmA	ArDe-V	Primary	Acer rubrum/Desmodium (Vaccinium)	M	D-DM
Merimod					
MnB	ArDe-V	Primary	Acer rubrum/Desmodium (Vaccinium)	M	D-DM
Merit					
MoB	ArDe-V	Primary	Acer rubrum/Desmodium (Vaccinium)	M	D-DM
Merit-Gardenvale					
MpA	PVHa	Primary	Pinus/Vaccinium-Hamamelis	P-M	D
Merrillan	PVRh	Secondary	Pinus/Vaccinium-Rubus	P	DM
MrA:					
Merrillan	PVHa	Primary	Pinus/Vaccinium-Hamamelis	P-M	D
	PVRh	Secondary	Pinus/Vaccinium-Rubus	P	DM
Veedum.					
MxA:					
Moppet	ArDe-V	Primary	Acer rubrum/Desmodium (Vaccinium)	M	D-DM
	PVCr	Secondary	Pinus/Vaccinium-Cornus	M	D
Fordum.					
OrA	ArCi	Primary	Acer rubrum/Circaea	M-R	M
Orion					
RkA	PVGy	Primary	Pinus/Vaccinium-Gaylussacia	P	D
Rockdam	PVCr	Secondary	Pinus/Vaccinium-Cornus	M	D
SeB, SeC2	ArCi	Primary	Acer rubrum/Circaea	M-R	M
Seaton					
SmB	ArCi	Primary	Acer rubrum/Circaea	M-R	M
Sebbo					
SoA	ArDe-V	Primary	Acer rubrum/Desmodium (Vaccinium)	M	D-DM
Sooner					
SpA	PVGy	Primary	Pinus/Vaccinium-Gaylussacia	P	D
Sparta	PVCr	Secondary	Pinus/Vaccinium-Cornus	M	D
TrB, TrC, TrF	PVGy	Primary	Pinus/Vaccinium-Gaylussacia	P	D
Tarr	PVCr	Secondary	Pinus/Vaccinium-Cornus	M	D

See footnotes at end of table.

Table 9.--Forest Habitat Types--Continued

Soil name and map symbol	Habitat type symbol	Dominance	Short scientific name	Nutrient regime*	Moisture regime**
TtA-------------------	PVGy	Primary	Pinus/Vaccinium-Gaylussacia-----------	P	D
Tint	PVCr	Secondary	Pinus/Vaccinium-Cornus----------------	M	D
TuB-------------------	PVCr	Primary	Pinus/Vaccinium-Cornus----------------	M	D
Tintson	ArDe-V	Secondary	Acer rubrum/Desmodium (Vaccinium)-----	M	D-DM
UfC2, UfD2-----------	ArDe-V	Primary	Acer rubrum/Desmodium (Vaccinium)-----	M	D-DM
Urne					
UrF:					
Urne-----------------	ArDe-V	Primary	Acer rubrum/Desmodium (Vaccinium)-----	M	D-DM
Council--------------	ArCi	Primary	Acer rubrum/Circaea-------------------	M-R	M

* VP indicates very poor; P, poor; M, medium; R, rich; and VR, very rich.

** VD indicates very dry; D, dry; DM, dry-mesic; M, mesic; WM, wet-mesic; and VW, very wet.

Table 10.--Windbreaks and Environmental Plantings

(Only the soils suitable for windbreaks and environmental plantings are listed. The symbol < means less than; > means more than. Absence of an entry indicates that trees generally do not grow to the given height on that soil)

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
AbA---------------- Absco	---	Silky dogwood, eastern redcedar, nannyberry viburnum, American cranberrybush.	Norway spruce-----	Eastern white pine, red pine, jack pine.	---
AcA:					
Absco------------	---	Silky dogwood, eastern redcedar, nannyberry viburnum, American cranberrybush.	Norway spruce-----	Eastern white pine, red pine, jack pine.	---
Northbend--------	---	Northern whitecedar, nannyberry viburnum, lilac, silky dogwood, American cranberrybush, redosier dogwood.	White spruce------	Eastern white pine, red maple, red pine, white ash.	Silver maple.
Ad---------------- Adder	---	Silky dogwood, common ninebark, Amur privet, American cranberrybush, late lilac, Siberian peashrub, nannyberry viburnum.	Northern whitecedar, Siberian crabapple.	Eastern white pine, green ash.	Imperial Carolina poplar.
ArA--------------- Arenzville	---	Northern whitecedar, lilac, American cranberrybush, nannyberry viburnum, silky dogwood, redosier dogwood.	White spruce------	Eastern white pine, red pine, white ash, red maple.	Silver maple.
BeB--------------- Bertrand	---	Lilac, northern whitecedar, Amur maple, American cranberrybush, gray dogwood.	White spruce, Norway spruce, Black Hills spruce.	Eastern white pine, red pine, white ash, red maple.	---

Table 10.--Windbreaks and Environmental Plantings--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
BkA----------------Bilmod	Manyflower cotoneaster.	Gray dogwood, silky dogwood, Siberian peashrub, Amur maple, lilac, eastern redcedar, American cranberrybush.	Norway spruce-----	Jack pine, red pine, eastern white pine.	---
BlB----------------Bilson	Manyflower cotoneaster.	Gray dogwood, silky dogwood, Siberian peashrub, American cranberrybush, Amur maple, lilac, eastern redcedar.	Norway spruce-----	Jack pine, red pine, eastern white pine.	---
BnB:					
Bilson------------	Manyflower cotoneaster.	Gray dogwood, silky dogwood, Siberian peashrub, American cranberrybush, Amur maple, lilac, eastern redcedar.	Norway spruce-----	Jack pine, red pine, eastern white pine.	---
Silverhill--------	Manyflower cotoneaster.	American cranberrybush, Siberian peashrub, Amur maple, lilac, silky dogwood.	Norway spruce, jack pine.	Eastern white pine, red pine.	---
BnC2, BnD2:					
Bilson------------	Manyflower cotoneaster.	Gray dogwood, silky dogwood, Siberian peashrub, American cranberrybush, Amur maple, lilac, eastern redcedar.	Norway spruce-----	Jack pine, red pine, eastern white pine.	---
Elevasil----------	---	Siberian peashrub, eastern redcedar, lilac, Amur maple, gray dogwood, silky dogwood.	Norway spruce-----	Eastern white pine, red pine, jack pine.	---

Table 10.--Windbreaks and Environmental Plantings--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
BoB, BoC, BoF: Boone	Manyflower cotoneaster.	Siberian peashrub, eastern redcedar, lilac, silky dogwood, gray dogwood, Amur maple, American cranberrybush.	Norway spruce	Eastern white pine, red pine, jack pine.	---
BpF:					
Boone	Manyflower cotoneaster.	Siberian peashrub, eastern redcedar, lilac, silky dogwood, gray dogwood, Amur maple, American cranberrybush.	Norway spruce	Eastern white pine, red pine, jack pine.	---
Elevasil	---	Siberian peashrub, eastern redcedar, lilac, Amur maple, gray dogwood, silky dogwood.	Norway spruce	Eastern white pine, red pine, jack pine.	---
CfA: Coffton	---	Redosier dogwood, silky dogwood, nannyberry viburnum, American cranberrybush, lilac, northern whitecedar.	White spruce	Silver maple, eastern white pine, red pine, white ash, red maple.	---
CoC2: Council	---	Northern whitecedar, lilac, American cranberrybush, Amur maple, gray dogwood.	White spruce, Norway spruce, Black Hills spruce.	Eastern white pine, red pine, white ash, red maple.	---
CpC2, CpD2:					
Council	---	Northern whitecedar, lilac, American cranberrybush, Amur maple, gray dogwood.	White spruce, Norway spruce, Black Hills spruce.	Eastern white pine, red pine, white ash, red maple.	---
Bilson	Manyflower cotoneaster.	Gray dogwood, silky dogwood, Siberian peashrub, American cranberrybush, Amur maple, lilac, eastern redcedar.	Norway spruce	Jack pine, red pine, eastern white pine.	---

Table 10.--Windbreaks and Environmental Plantings--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
CsD2, CsE: Council	---	Northern whitecedar, lilac, American cranberrybush, Amur maple, gray dogwood.	White spruce, Norway spruce, Black Hills spruce.	Eastern white pine, red pine, white ash, red maple.	---
Seaton	---	Gray dogwood, redosier dogwood, lilac, Siberian peashrub.	Hackberry, northern whitecedar, Russian-olive, eastern redcedar, Amur maple, blue spruce.	Eastern white pine, green ash.	---
ElB, ElC2, ElD2 Elevasil	---	Siberian peashrub, eastern redcedar, lilac, Amur maple, gray dogwood, silky dogwood.	Norway spruce	Eastern white pine, red pine, jack pine.	---
Eo Elm Lake	---	Northern whitecedar, American cranberrybush, nannyberry viburnum, silky dogwood, redosier dogwood, common ninebark.	White spruce, balsam fir.	Silver maple, white ash, green ash, red maple.	---
FaA Fairchild	---	Northern whitecedar, lilac, silky dogwood, American cranberrybush, nannyberry viburnum, redosier dogwood.	White spruce	Eastern white pine, red pine, white ash, red maple, silver maple.	---
FeA: Fairchild	---	Northern whitecedar, lilac, silky dogwood, American cranberrybush, nannyberry viburnum, redosier dogwood.	White spruce	Eastern white pine, red pine, white ash, red maple, silver maple.	---
Elm Lake	---	Northern whitecedar, American cranberrybush, nannyberry viburnum, silky dogwood, redosier dogwood, common ninebark.	White spruce, balsam fir.	Silver maple, white ash, green ash, red maple.	---

Table 10.--Windbreaks and Environmental Plantings--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
GaC2, GaD2: Gale	Manyflower cotoneaster.	Siberian peashrub, silky dogwood, eastern redcedar, American cranberrybush, Amur maple, lilac, gray dogwood.	Norway spruce	Eastern white pine, red pine, jack pine.	---
GoB, GoC: Gosil	Manyflower cotoneaster.	Siberian peashrub, lilac, silky dogwood, eastern redcedar, Amur maple, American cranberrybush, gray dogwood.	Norway spruce	Eastern white pine, red pine, jack pine.	---
HkB:					
Hiles	Manyflower cotoneaster.	Eastern redcedar, lilac, American cranberrybush, Amur maple, silky dogwood, gray dogwood.	Siberian peashrub, Norway spruce.	Eastern white pine, red pine, jack pine.	---
Kert	---	Northern whitecedar, lilac, American cranberrybush, nannyberry viburnum, silky dogwood, redosier dogwood.	White spruce	Eastern white pine, red pine, white ash, red maple, silver maple.	---
HnB, HnC2, HnD2: Hixton	Manyflower cotoneaster.	Gray dogwood, silky dogwood, Siberian peashrub, American cranberrybush, Amur maple, lilac, eastern redcedar.	Norway spruce	Eastern white pine, red pine, jack pine.	---
HpA: Hoop	---	Northern whitecedar, nannyberry viburnum, redosier dogwood, lilac.	Amur maple, white spruce.	Eastern white pine, hackberry, red maple, white ash, green ash.	Silver maple.
HuB: Humbird	Manyflower cotoneaster.	Eastern redcedar, Siberian peashrub, lilac, American cranberrybush, Amur maple, silky dogwood, gray dogwood.	Norway spruce	Eastern white pine, red pine, jack pine.	---

Table 10.--Windbreaks and Environmental Plantings--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
HxB:					
Humbird	Manyflower cotoneaster.	Eastern redcedar, Siberian peashrub, lilac, American cranberrybush, Amur maple, silky dogwood, gray dogwood.	Norway spruce	Eastern white pine, red pine, jack pine.	---
Merrillan	---	Nannyberry viburnum, northern whitecedar, lilac, American cranberrybush, silky dogwood, redosier dogwood.	White spruce	Eastern white pine, red pine, white ash, red maple, silver maple.	---
ImA: Impact	Manyflower cotoneaster.	Eastern redcedar, lilac, Amur maple, American cranberrybush, Siberian peashrub, silky dogwood, gray dogwood.	Norway spruce	Eastern white pine, red pine, jack pine.	---
IrA: Ironrun	-	Common ninebark, lilac, American cranberrybush, Amur maple, silky dogwood, gray dogwood.	White spruce, Norway spruce.	Eastern white pine, red pine, white ash, red maple.	---
IxA:					
Ironrun	---	Common ninebark, lilac, American cranberrybush, Amur maple, silky dogwood, gray dogwood.	White spruce, Norway spruce.	Eastern white pine, red pine, white ash, red maple.	---
Ponycreek.					
IzB:					
Ironrun	---	Common ninebark, lilac, American cranberrybush, Amur maple, silky dogwood, gray dogwood.	White spruce, Norway spruce.	Eastern white pine, red pine, white ash, red maple.	---
Ponycreek.					
Arbutus	---	Autumn-olive, lilac, white spruce, Amur privet.	Hawthorn	Red pine, eastern white pine, jack pine.	---

Table 10.--Windbreaks and Environmental Plantings--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
JaA, JaB: Jackson	---	Northern whitecedar, lilac, Amur maple, American cranberrybush, gray dogwood.	White spruce, Black Hills spruce, Norway spruce.	Eastern white pine, red pine, white ash, red maple.	---
Ka: Kalmarville	---	American plum, redosier dogwood.	Tall purple willow, hackberry, northern whitecedar, white spruce, Amur maple.	Golden willow, green ash.	Eastern cottonwood, silver maple.
KeA: Kert	---	Northern whitecedar, lilac, American cranberrybush, nannyberry viburnum, silky dogwood, redosier dogwood.	White spruce	Eastern white pine, red pine, white ash, red maple, silver maple.	---
LfC2, LfD2: La Farge	Manyflower cotoneaster.	Siberian peashrub, eastern redcedar, lilac, American cranberrybush, Amur maple, silky dogwood, gray dogwood.	Norway spruce	Eastern white pine, red pine, jack pine.	---
LsD2:					
La Farge	Manyflower cotoneaster.	Siberian peashrub, eastern redcedar, lilac, American cranberrybush, Amur maple, silky dogwood, gray dogwood.	Norway spruce	Eastern white pine, red pine, jack pine.	---
Seaton	---	Gray dogwood, redosier dogwood, lilac, Siberian peashrub.	Hackberry, northern whitecedar, Russian-olive, eastern redcedar, Amur maple, blue spruce.	Eastern white pine, green ash.	---
Lt: Loxley	---	Common ninebark, nannyberry viburnum, silky dogwood, lilac, American cranberrybush, gray dogwood.	Siberian crabapple, northern whitecedar.	Eastern white pine, green ash, Norway spruce.	Imperial Carolina poplar.

Table 10.--Windbreaks and Environmental Plantings--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
LuB: Ludington	Manyflower cotoneaster.	Eastern redcedar, Amur maple, American cranberrybush, lilac, silky dogwood, gray dogwood, Siberian peashrub.	Norway spruce	Eastern white pine, red pine, jack pine.	---
LxB:					
Ludington	Manyflower cotoneaster.	Eastern redcedar, Amur maple, American cranberrybush, lilac, silky dogwood, gray dogwood, Siberian peashrub.	Norway spruce	Eastern white pine, red pine, jack pine.	---
Fairchild	---	Northern whitecedar, lilac, silky dogwood, American cranberrybush, nannyberry viburnum, redosier dogwood.	White spruce	Eastern white pine, red pine, white ash, red maple, silver maple.	---
MaB: Mahtomedi	Manyflower cotoneaster.	Gray dogwood, silky dogwood, Siberian peashrub, American cranberrybush, Amur maple, lilac, eastern redcedar.	Norway spruce	Jack pine, red pine, eastern white pine.	---
MbA: Majik	---	Silky dogwood, American cranberrybush, lilac, redosier dogwood, nannyberry viburnum, northern whitecedar.	White spruce	White ash, red pine, red maple, silver maple, eastern white pine.	---
MmA: Merimod	Siberian peashrub, lilac.	Eastern redcedar, Manchurian crabapple, hackberry.	Eastern white pine, jack pine, green ash, bur oak, honeylocust, Russian-olive.	-	---
MnB: Merit	Siberian peashrub, lilac.	Manchurian crabapple, hackberry.	Eastern white pine, jack pine, green ash, bur oak, honeylocust, Russian-olive.	Red maple	---

Table 10.--Windbreaks and Environmental Plantings--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
MoB:					
Merit	Siberian peashrub, lilac.	Manchurian crabapple, hackberry.	Eastern white pine, jack pine, green ash, bur oak, honeylocust, Russian-olive.	Red maple	---
Gardenvale	Manyflower cotoneaster.	American cranberrybush, Siberian peashrub, Amur maple, lilac, silky dogwood.	Norway spruce, jack pine.	Eastern white pine, red pine.	---
MpA: Merrillan	---	Nannyberry viburnum, northern whitecedar, lilac, American cranberrybush, silky dogwood, redosier dogwood.	White spruce	Eastern white pine, red pine, white ash, red maple, silver maple.	---
MrA:					
Merrillan	---	Nannyberry viburnum, northern whitecedar, lilac, American cranberrybush, silky dogwood, redosier dogwood.	White spruce	Eastern white pine, red pine, white ash, red maple, silver maple.	---
Veedum.					
MxA:					
Moppet	---	Northern whitecedar, lilac, redosier dogwood, silky dogwood, American cranberrybush, nannyberry viburnum.	White spruce	Eastern white pine, red pine, white ash, red maple, silver maple.	---
Fordum.					
OrA: Orion	---	Common ninebark, nannyberry viburnum, northern whitecedar, lilac, American cranberrybush, silky dogwood, redosier dogwood.	White spruce	Eastern white pine, white ash, red maple, silver maple.	---

Table 10.--Windbreaks and Environmental Plantings--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
RkA--------------- Rockdam	Manyflower cotoneaster.	Eastern redcedar, Amur maple, Siberian peashrub, gray dogwood, lilac, American cranberrybush, silky dogwood.	Red pine, Norway spruce.	Eastern white pine, jack pine.	---
RoA--------------- Rowley	---	Northern whitecedar, redosier dogwood, American cranberrybush, nannyberry viburnum, lilac, silky dogwood.	White spruce------	Eastern white pine, red pine, white ash, silver maple, red maple.	---
SeB, SeC2--------- Seaton	---	Gray dogwood, redosier dogwood, lilac, Siberian peashrub.	Hackberry, northern whitecedar, Russian-olive, eastern redcedar, Amur maple, blue spruce.	Eastern white pine, green ash.	---
SmB--------------- Sebbo	---	Northern whitecedar, lilac, Amur maple, gray dogwood.	White spruce, Norway spruce, Black Hills spruce.	Eastern white pine, red pine, white ash, red maple.	---
SnA--------------- Sechler	---	Northern whitecedar, American cranberrybush, lilac, redosier dogwood, silky dogwood, nannyberry viburnum.	White spruce------	Eastern white pine, red pine, white ash, silver maple, red maple.	---
SoA--------------- Sooner	---	Northern whitecedar, lilac, nannyberry viburnum, silky dogwood, gray dogwood, American cranberrybush.	White spruce------	Eastern white pine, red pine, white ash, red maple, silver maple.	---
SpA--------------- Sparta	Manyflower cotoneaster.	Siberian peashrub, Amur maple, lilac, eastern redcedar, American cranberrybush, gray dogwood, silky dogwood.	Norway spruce-----	Red pine, eastern white pine, jack pine.	---

Table 10.--Windbreaks and Environmental Plantings--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
TrB, TrC, TrF: Tarr	Manyflower cotoneaster.	Eastern redcedar, lilac, Amur maple, American cranberrybush, Siberian peashrub, silky dogwood, gray dogwood.	Norway spruce	Eastern white pine, red pine, jack pine.	---
TtA: Tint	Manyflower cotoneaster.	Eastern redcedar, Amur maple, Siberian peashrub, gray dogwood, lilac, American cranberrybush, silky dogwood.	Norway spruce	Eastern white pine, jack pine, red pine.	---
TuB: Tintson	---	Eastern redcedar, lilac, Amur maple, Siberian peashrub, silky dogwood, gray dogwood.	---	Eastern white pine, red pine, jack pine.	---
TwA: Toddville	---	Gray dogwood, Amur maple, American cranberrybush, lilac, northern whitecedar.	Black Hills spruce, white spruce, Norway spruce.	Eastern white pine, red pine, white ash, red maple.	---
UfC2, UfD2: Urne	Manyflower cotoneaster.	Eastern redcedar, lilac, Amur maple, American cranberrybush, silky dogwood, gray dogwood, Siberian peashrub.	Norway spruce	Eastern white pine, red pine, jack pine.	---
UrF:					
Urne	Manyflower cotoneaster.	Eastern redcedar, lilac, Amur maple, American cranberrybush, silky dogwood, gray dogwood, Siberian peashrub.	Norway spruce	Eastern white pine, red pine, jack pine.	---
Council	---	Northern whitecedar, lilac, American cranberrybush, Amur maple, gray dogwood.	White spruce, Norway spruce, Black Hills spruce.	Eastern white pine, red pine, white ash, red maple.	---

Table 10.--Windbreaks and Environmental Plantings--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
Vs: Veedum.					
Elm Lake	---	Northern whitecedar, American cranberrybush, nannyberry viburnum, silky dogwood, redosier dogwood, common ninebark.	White spruce, balsam fir.	Silver maple, white ash, green ash, red maple.	---
WmA: Whitehall	Manyflower cotoneaster.	Eastern redcedar, lilac, gray dogwood, silky dogwood, Siberian peashrub, Amur maple, American cranberrybush.	Norway spruce	Eastern white pine, red pine, jack pine.	---

Table 11.--Recreational Development

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
AbA: Absco	Severe: flooding.	Slight	Moderate: small stones, flooding.	Slight	Moderate: droughty, flooding.
AcA:					
Absco	Severe: flooding.	Slight	Moderate: small stones, flooding.	Slight	Moderate: droughty, flooding.
Northbend	Severe: flooding, wetness, too acid.	Severe: too acid.	Severe: wetness, flooding, too acid.	Moderate: wetness, flooding.	Severe: too acid, flooding.
Ad: Adder	Severe: flooding, ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding, flooding.	Severe: ponding, excess humus.	Severe: ponding, flooding, excess humus.
ArA: Arenzville	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: flooding.
BeB: Bertrand	Slight	Slight	Moderate: slope.	Slight	Slight.
BkA: Bilmod	Slight	Slight	Slight	Slight	Moderate: droughty.
BlB: Bilson	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: droughty.
BnB:					
Bilson	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: droughty.
Silverhill	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
BnC2:					
Bilson	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope.
Elevasil	Severe: too acid.	Severe: too acid.	Severe: slope, too acid.	Slight	Severe: too acid.
BnD2:					
Bilson	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Elevasil	Severe: slope, too acid.	Severe: slope, too acid.	Severe: slope, too acid.	Moderate: slope.	Severe: too acid, slope.

Table 11.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
BoB-------------------- Boone	Severe: too sandy, too acid.	Severe: too sandy, too acid.	Severe: too sandy, too acid.	Severe: too sandy.	Severe: too acid, droughty.
BoC-------------------- Boone	Severe: too sandy, too acid.	Severe: too sandy, too acid.	Severe: slope, too sandy, too acid.	Severe: too sandy.	Severe: too acid, droughty.
BoF-------------------- Boone	Severe: slope, too sandy, too acid.	Severe: slope, too sandy, too acid.	Severe: slope, too sandy, too acid.	Severe: too sandy, slope.	Severe: too acid, droughty, slope.
BpF:					
Boone----------------	Severe: slope, too sandy, too acid.	Severe: slope, too sandy, too acid.	Severe: slope, too sandy, too acid.	Severe: too sandy, slope.	Severe: too acid, droughty, slope.
Elevasil-------------	Severe: slope, too acid.	Severe: slope, too acid.	Severe: slope, too acid.	Severe: slope.	Severe: too acid, slope.
Cd--------------------- Citypoint	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
CfA-------------------- Coffton	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.
CoC2------------------- Council	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
CpC2:					
Council--------------	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight------------	Moderate: slope.
Bilson---------------	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight------------	Moderate: droughty, slope.
CpD2:					
Council--------------	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Bilson---------------	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
CsD2:					
Council--------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
Seaton---------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
CsE:					
Council--------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.

Table 11.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
CsE:					
Seaton	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
Da: Dawsil	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
DuA: Dunnville	Slight	Slight	Slight	Slight	Moderate: droughty.
ElB: Elevasil	Severe: too acid.	Severe: too acid.	Severe: too acid.	Slight	Severe: too acid.
ElC2: Elevasil	Severe: too acid.	Severe: too acid.	Severe: slope, too acid.	Slight	Severe: too acid.
ElD2: Elevasil	Severe: slope, too acid.	Severe: slope, too acid.	Severe: slope, too acid.	Moderate: slope.	Severe: too acid, slope.
Eo: Elm Lake	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Et: Ettrick	Severe: flooding, ponding.	Severe: ponding.	Severe: ponding, flooding.	Severe: ponding.	Severe: ponding, flooding.
FaA: Fairchild	Severe: wetness, too sandy, too acid.	Severe: wetness, too sandy, too acid.	Severe: too sandy, wetness, too acid.	Severe: wetness, too sandy.	Severe: too acid, wetness.
FeA:					
Fairchild	Severe: wetness, too sandy, too acid.	Severe: wetness, too sandy, too acid.	Severe: too sandy, wetness, too acid.	Severe: wetness, too sandy.	Severe: too acid, wetness.
Elm Lake	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
GaC2: Gale	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope, thin layer, area reclaim.
GaD2: Gale	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
GoB: Gosil	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, small stones, too sandy.	Moderate: too sandy.	Moderate: droughty.
GoC: Gosil	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: too sandy.	Moderate: droughty, slope.

Table 11.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
HkB:					
Hiles	Moderate: wetness.	Moderate: wetness.	Moderate: slope, wetness, depth to rock.	Severe: erodes easily.	Moderate: wetness, depth to rock.
Kert	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, depth to rock.
HnB Hixton	Slight	Slight	Moderate: slope, depth to rock.	Slight	Moderate: depth to rock.
HnC2 Hixton	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope, depth to rock.
HnD2 Hixton	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
HpA Hoop	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, droughty.
Ht Houghton	Severe: flooding, wetness, excess humus.	Severe: wetness, excess humus.	Severe: excess humus, wetness, flooding.	Severe: wetness, excess humus.	Severe: wetness, flooding, excess humus.
HuB Humbird	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, depth to rock.	Moderate: wetness.	Moderate: wetness, droughty.
HxB:					
Humbird	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, depth to rock.	Moderate: wetness.	Moderate: wetness, droughty.
Merrillan	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
ImA Impact	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty, too sandy.
IrA Ironrun	Severe: wetness, too sandy, too acid.	Severe: wetness, too sandy, too acid.	Severe: too sandy, wetness, too acid.	Severe: wetness, too sandy.	Severe: too acid, wetness, droughty.
IxA:					
Ironrun	Severe: wetness, too sandy, too acid.	Severe: wetness, too sandy, too acid.	Severe: too sandy, wetness, too acid.	Severe: wetness, too sandy.	Severe: too acid, wetness, droughty.

Table 11.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
IxA:					
Ponycreek	Severe: ponding, excess humus, too acid.	Severe: ponding, excess humus, too acid.	Severe: excess humus, ponding, too acid.	Severe: ponding, excess humus.	Severe: too acid, ponding, excess humus.
IzB:					
Ironrun	Severe: wetness, too sandy, too acid.	Severe: wetness, too sandy, too acid.	Severe: too sandy, wetness, too acid.	Severe: wetness, too sandy.	Severe: too acid, wetness, droughty.
Ponycreek	Severe: ponding, excess humus, too acid.	Severe: ponding, excess humus, too acid.	Severe: excess humus, ponding, too acid.	Severe: ponding, excess humus.	Severe: too acid, ponding, excess humus.
Arbutus	Severe: too acid.	Severe: too acid.	Severe: too acid.	Moderate: too sandy.	Severe: too acid.
JaA Jackson	Slight	Slight	Slight	Slight	Slight.
JaB Jackson	Slight	Slight	Moderate: slope.	Slight	Slight.
Ka Kalmarville	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.
KeA Kert	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, depth to rock.
LfC2 La Farge	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope, thin layer, area reclaim.
LfD2 La Farge	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
LsD2:					
La Farge	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
Seaton	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
Lt Loxley	Severe: ponding, excess humus, too acid.	Severe: ponding, excess humus, too acid.	Severe: excess humus, ponding, too acid.	Severe: ponding, excess humus.	Severe: too acid, ponding, excess humus.
LuB Ludington	Severe: too sandy, too acid.	Severe: too sandy, too acid.	Severe: too sandy, too acid.	Severe: too sandy.	Severe: too acid.
LxB:					
Ludington	Severe: too sandy, too acid.	Severe: too sandy, too acid.	Severe: too sandy, too acid.	Severe: too sandy.	Severe: too acid.

Table 11.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
LxB:					
Fairchild	Severe: wetness, too sandy, too acid.	Severe: wetness, too sandy, too acid.	Severe: too sandy, wetness, too acid.	Severe: wetness, too sandy.	Severe: too acid, wetness.
MaB Mahtomedi	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope.	Moderate: too sandy.	Moderate: droughty.
MbA Majik	Severe: wetness.	Moderate: wetness, too sandy.	Severe: wetness.	Moderate: wetness, too sandy.	Moderate: wetness, droughty.
MmA Merimod	Slight	Slight	Moderate: small stones.	Slight	Slight.
MnB Merit	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
MoB:					
Merit	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
Gardenvale	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
MpA Merrillan	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
MrA:					
Merrillan	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Veedum	Severe: ponding, too acid.	Severe: ponding, too acid.	Severe: ponding, too acid.	Severe: ponding.	Severe: too acid, ponding.
MxA:					
Moppet	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: flooding.
Fordum	Severe: flooding, ponding.	Severe: ponding.	Severe: ponding, flooding.	Severe: ponding.	Severe: ponding, flooding.
Ne Newlang	Severe: flooding, ponding, excess humus.	Severe: ponding, excess humus, too acid.	Severe: excess humus, ponding, too acid.	Severe: ponding, excess humus.	Severe: too acid, ponding, excess humus.
OrA Orion	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.
Pa Palms	Severe: flooding, ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding, flooding.	Severe: ponding, excess humus.	Severe: ponding, flooding, excess humus.

Table 11.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Pt. Pits					
Pu Ponycreek	Severe: ponding, excess humus, too acid.	Severe: ponding, excess humus, too acid.	Severe: excess humus, ponding, too acid.	Severe: ponding, excess humus.	Severe: too acid, ponding, excess humus.
Pv:					
Ponycreek	Severe: ponding, excess humus, too acid.	Severe: ponding, excess humus, too acid.	Severe: excess humus, ponding, too acid.	Severe: ponding, excess humus.	Severe: too acid, ponding, excess humus.
Dawsil	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
Pw Psammaquents	Severe: flooding, wetness.	Severe: wetness, too sandy.	Severe: too sandy, wetness, flooding.	Severe: wetness, too sandy.	Severe: wetness, flooding.
RkA Rockdam	Severe: too sandy, too acid.	Severe: too sandy, too acid.	Severe: too sandy, too acid.	Severe: too sandy.	Severe: too acid, droughty.
RoA Rowley	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
SeB Seaton	Slight	Slight	Moderate: slope.	Slight	Slight.
SeC2 Seaton	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
SmB Sebbo	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
SnA Sechler	Severe: flooding, wetness, too acid.	Severe: too acid.	Severe: wetness, too acid.	Moderate: wetness.	Severe: too acid.
SoA Sooner	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
SpA Sparta	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty, too sandy.
TrB Tarr	Severe: too sandy, too acid.	Severe: too sandy, too acid.	Severe: too sandy, too acid.	Severe: too sandy.	Severe: too acid.
TrC Tarr	Severe: too sandy, too acid.	Severe: too sandy, too acid.	Severe: slope, too sandy, too acid.	Severe: too sandy.	Severe: too acid.

Table 11.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
TrF: Tarr	Severe: slope, too sandy, too acid.	Severe: slope, too sandy, too acid.	Severe: slope, too sandy, too acid.	Severe: too sandy, slope.	Severe: too acid, slope.
TtA: Tint	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: droughty.
TuB: Tintson	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty, too sandy.
TwA: Toddville	Slight	Slight	Slight	Slight	Slight.
UdF: Udorthents	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
UfC2: Urne	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope, thin layer, area reclaim.
UfD2: Urne	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
UrF:					
Urne	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Council	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
Vs:					
Veedum	Severe: ponding, excess humus, too acid.	Severe: ponding, excess humus, too acid.	Severe: excess humus, ponding, too acid.	Severe: ponding, excess humus.	Severe: too acid, ponding, excess humus.
Elm Lake	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
WmA: Whitehall	Severe: flooding.	Slight	Slight	Slight	Slight.

Table 12.--Wildlife Habitat

(See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
AbA-----------------Absco	Poor	Fair	Fair	Poor	Fair	Poor	Very poor.	Fair	Fair	Very poor.
AcA:										
Absco--------------	Poor	Fair	Fair	Poor	Fair	Poor	Very poor.	Fair	Fair	Very poor.
Northbend----------	Fair	Fair	Good	Good	Good	Fair	Fair	Fair	Good	Fair.
Ad-----------------Adder	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
ArA-----------------Arenzville	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
BeB-----------------Bertrand	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
BkA-----------------Bilmod	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
BlB-----------------Bilson	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
BnB:										
Bilson-------------	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Silverhill---------	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
BnC2:										
Bilson-------------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Elevasil-----------	Good	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Fair	Very poor.
BnD2:										
Bilson-------------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Elevasil-----------	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
BoB, BoC------------Boone	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
BoF-----------------Boone	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
BpF:										
Boone--------------	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Elevasil-----------	Poor	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.

Table 12.--Wildlife Habitat--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Hardwood trees	Conif- erous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
Cd------------------ Citypoint	Very poor.	Poor	Poor	Poor	Poor	Poor	Good	Poor	Poor	Fair.
CfA----------------- Coffton	Good	Good	Good	Good	Good	Good	Fair	Good	Good	Fair.
CoC2---------------- Council	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
CpC2:										
Council-----------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Bilson------------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
CpD2:										
Council-----------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Bilson------------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
CsD2:										
Council-----------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Seaton------------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
CsE:										
Council-----------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Seaton------------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Da------------------ Dawsil	Very poor.	Poor	Poor	Poor	Poor	Poor	Good	Poor	Poor	Fair.
DuA----------------- Dunnville	Fair	Fair	Good	Good	Good	Poor	Poor	Fair	Fair	Poor.
ElB, ElC2----------- Elevasil	Good	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Fair	Very poor.
ElD2---------------- Elevasil	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Eo------------------ Elm Lake	Poor	Poor	Fair	Fair	Fair	Poor	Good	Poor	Fair	Fair.
Et------------------ Ettrick	Good	Good	Fair	Good	Fair	Good	Good	Good	Good	Good.
FaA----------------- Fairchild	Poor	Fair	Good	Fair	Fair	Fair	Fair	Poor	Fair	Fair.
FeA:										
Fairchild---------	Poor	Fair	Good	Fair	Fair	Fair	Fair	Poor	Fair	Fair.

Table 12.--Wildlife Habitat--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
FeA:										
Elm Lake	Poor	Poor	Fair	Fair	Fair	Poor	Good	Poor	Fair	Fair.
GaC2 Gale	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
GaD2 Gale	Poor	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
GoB, GoC Gosil	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
HkB:										
Hiles	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Kert	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
HnB Hixton	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
HnC2 Hixton	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
HnD2 Hixton	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
HpA Hoop	Fair	Good	Good	Good	Good	Fair	Poor	Good	Good	Poor.
Ht Houghton	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Good	Good	Very poor.	Very poor.	Good.
HuB Humbird	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Poor.
HxB:										
Humbird	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Poor.
Merrillan	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
ImA Impact	Poor	Poor	Fair	Poor	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
IrA Ironrun	Poor	Fair	Good	Good	Good	Poor	Poor	Fair	Good	Poor.
IxA:										
Ironrun	Poor	Fair	Good	Good	Good	Poor	Poor	Fair	Good	Poor.
Ponycreek	Fair	Fair	Fair	Poor	Poor	Good	Good	Fair	Poor	Good.
IzB:										
Ironrun	Poor	Fair	Good	Good	Good	Poor	Poor	Fair	Good	Poor.
Ponycreek	Fair	Fair	Fair	Poor	Poor	Good	Good	Fair	Poor	Good.
Arbutus	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.

Table 12.--Wildlife Habitat--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
JaA, JaB----------- Jackson	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Ka----------------- Kalmarville	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
KeA---------------- Kert	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
LfC2--------------- La Farge	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
LfD2--------------- La Farge	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
LsD2:										
La Farge----------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Seaton------------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Lt----------------- Loxley	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
LuB---------------- Ludington	Very poor.	Fair	Good	Fair	Fair	Poor	Very poor.	Poor	Fair	Very poor.
LxB:										
Ludington---------	Very poor.	Fair	Good	Fair	Fair	Poor	Very poor.	Poor	Fair	Very poor.
Fairchild---------	Poor	Fair	Good	Fair	Fair	Fair	Fair	Poor	Fair	Fair.
MaB---------------- Mahtomedi	Poor	Fair	Fair	Poor	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
MbA---------------- Majik	Poor	Fair	Good	Fair	Fair	Fair	Fair	Fair	Fair	Fair.
MmA---------------- Merimod	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
MnB---------------- Merit	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
MoB:										
Merit-------------	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Gardenvale--------	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
MpA---------------- Merrillan	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
MrA:										
Merrillan---------	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Veedum------------	Fair	Good	Poor	Poor	Poor	Good	Good	Fair	Poor	Good.

Table 12.--Wildlife Habitat--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
MxA:										
Moppet	Poor	Fair	Fair	Good	Good	Poor	Poor	Fair	Good	Poor.
Fordum	Very poor.	Very poor.	Poor	Fair	Fair	Good	Good	Very poor.	Fair	Good.
Ne: Newlang	Poor	Poor	Fair	Poor	Poor	Good	Good	Poor	Poor	Good.
OrA: Orion	Good	Good	Good	Good	Good	Good	Fair	Good	Good	Good.
Pa: Palms	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Good	Good	Very poor.	Very poor.	Good.
Pt. Pits										
Pu: Ponycreek	Fair	Fair	Fair	Poor	Poor	Good	Good	Fair	Poor	Good.
Pv:										
Ponycreek	Fair	Fair	Fair	Poor	Poor	Good	Good	Fair	Poor	Good.
Dawsil	Very poor.	Poor	Poor	Poor	Poor	Poor	Good	Poor	Poor	Fair.
Pw: Psammaquents	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
RkA: Rockdam	Poor	Fair	Good	Fair	Good	Poor	Very poor.	Fair	Good	Very poor.
RoA: Rowley	Good	Good	Good	Good	Good	Fair	Poor	Good	Good	Poor.
SeB, SeC2: Seaton	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
SmB: Sebbo	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
SnA: Sechler	Fair	Fair	Good	Good	Good	Fair	Fair	Fair	Good	Fair.
SoA: Sooner	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
SpA: Sparta	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
TrB, TrC, TrF: Tarr	Poor	Poor	Good	Poor	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
TtA: Tint	Poor	Poor	Good	Poor	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
TuB: Tintson	Poor	Poor	Good	Poor	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
TwA: Toddville	Good	Good	Good	Poor	Poor	Poor	Very poor.	Good	Poor	Very poor.

Table 12.--Wildlife Habitat--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Hardwood trees	Conif- erous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
UdF. Udorthents										
UfC2---------------- Urne	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
UfD2---------------- Urne	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
UrF:										
Urne---------------	Very poor.	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Council------------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Vs:										
Veedum-------------	Fair	Good	Poor	Poor	Poor	Good	Good	Fair	Poor	Good.
Elm Lake-----------	Poor	Poor	Fair	Fair	Fair	Poor	Good	Poor	Fair	Fair.
WmA----------------- Whitehall	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.

Table 13.--Building Site Development

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
AbA------------- Absco	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: droughty, flooding.
AcA:						
Absco-----------	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: droughty, flooding.
Northbend--------	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, frost action.	Severe: too acid, flooding.
Ad--------------- Adder	Severe: cutbanks cave, excess humus, ponding.	Severe: subsides, flooding, ponding.	Severe: subsides, flooding, ponding.	Severe: subsides, flooding, ponding.	Severe: subsides, ponding, flooding.	Severe: ponding, flooding, excess humus.
ArA-------------- Arenzville	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding, frost action.	Moderate: flooding.
BeB-------------- Bertrand	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
BkA-------------- Bilmod	Severe: cutbanks cave.	Slight---------	Moderate: wetness.	Slight---------	Moderate: frost action.	Moderate: droughty.
BlB-------------- Bilson	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Moderate: frost action.	Moderate: droughty.
BnB:						
Bilson-----------	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Moderate: frost action.	Moderate: droughty.
Silverhill-------	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Moderate: frost action.	Moderate: droughty.
BnC2:						
Bilson-----------	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: droughty, slope.
Elevasil---------	Severe: cutbanks cave.	Moderate: slope.	Moderate: depth to rock, slope.	Severe: slope.	Moderate: slope, frost action.	Severe: too acid.
BnD2:						
Bilson-----------	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Elevasil---------	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: too acid, slope.

Table 13.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
BoB: Boone	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Severe: too acid, droughty.
BoC: Boone	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: too acid, droughty.
BoF: Boone	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: too acid, droughty, slope.
BpF:						
Boone	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: too acid, droughty, slope.
Elevasil	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: too acid, slope.
Cd: Citypoint	Severe: cutbanks cave, excess humus, ponding.	Severe: ponding, low strength.	Severe: ponding.	Severe: ponding, low strength.	Severe: ponding, frost action.	Severe: ponding, excess humus.
CfA: Coffton	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, frost action.	Moderate: wetness, flooding.
CoC2: Council	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
CpC2:						
Council	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
Bilson	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: droughty, slope.
CpD2:						
Council	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Bilson	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
CsD2, CsE:						
Council	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Seaton	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.

Table 13.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Da: Dawsil	Severe: cutbanks cave, excess humus, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, frost action.	Severe: ponding, excess humus.
DuA: Dunnville	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
ElB: Elevasil	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Moderate: frost action.	Severe: too acid.
ElC2: Elevasil	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Severe: too acid.
ElD2: Elevasil	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: too acid, slope.
Eo: Elm Lake	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Et: Ettrick	Severe: cutbanks cave, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: low strength, ponding, flooding.	Severe: ponding, flooding.
FaA: Fairchild	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness, frost action.	Severe: too acid, wetness.
FeA:						
Fairchild	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness, frost action.	Severe: too acid, wetness.
Elm Lake	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, excess humus.
GaC2: Gale	Severe: cutbanks cave.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope, thin layer, area reclaim.
GaD2: Gale	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
GoB: Gosil	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
GoC: Gosil	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
HkB:						
Hiles	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell, wetness.	Moderate: wetness, depth to rock.

Table 13.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
HkB:						
Kert	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness, depth to rock.
HnB Hixton	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Moderate: frost action.	Moderate: depth to rock.
HnC2 Hixton	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope, depth to rock.
HnD2 Hixton	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
HpA Hoop	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness, frost action.	Moderate: wetness, droughty.
Ht Houghton	Severe: excess humus, wetness.	Severe: subsides, flooding, wetness.	Severe: subsides, flooding, wetness.	Severe: subsides, flooding, wetness.	Severe: subsides, wetness, flooding.	Severe: wetness, flooding, excess humus.
HuB Humbird	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, frost action.	Moderate: wetness, droughty.
HxB:						
Humbird	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, frost action.	Moderate: wetness, droughty.
Merrillan	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, wetness, frost action.	Severe: wetness.
ImA Impact	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty, too sandy.
IrA Ironrun	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: too acid, wetness, droughty.
IxA:						
Ironrun	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: too acid, wetness, droughty.
Ponycreek	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: too acid, ponding, excess humus.

Table 13.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
IzB:						
Ironrun----------	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: too acid, wetness, droughty.
Ponycreek--------	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: too acid, ponding, excess humus.
Arbutus----------	Severe: depth to rock, cutbanks cave.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: slope, depth to rock.	Moderate: depth to rock.	Severe: too acid.
JaA--------------- Jackson	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: wetness.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
JaB--------------- Jackson	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: wetness.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
Ka---------------- Kalmarville	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding, frost action.	Severe: wetness, flooding.
KeA--------------- Kert	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness, depth to rock.
LfC2-------------- La Farge	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope, thin layer, area reclaim.
LfD2-------------- La Farge	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
LsD2:						
La Farge---------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
Seaton-----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
Lt---------------- Loxley	Severe: excess humus, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, frost action.	Severe: too acid, ponding, excess humus.
LuB--------------- Ludington	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Severe: too acid.

Table 13.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
LxB:						
Ludington--------	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Severe: too acid.
Fairchild--------	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: too acid, wetness.
MaB--------------- Mahtomedi	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: droughty.
MbA--------------- Majik	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness, frost action.	Moderate: wetness, droughty.
MmA--------------- Merimod	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: wetness.	Moderate: shrink-swell.	Moderate: shrink-swell, frost action.	Slight.
MnB--------------- Merit	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell, frost action.	Slight.
MoB:						
Merit------------	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell, frost action.	Slight.
Gardenvale-------	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Moderate: low strength, frost action.	Slight.
MpA--------------- Merrillan	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, wetness, frost action.	Severe: wetness.
MrA:						
Merrillan--------	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, wetness, frost action.	Severe: wetness.
Veedum-----------	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: too acid, ponding.
MxA:						
Moppet-----------	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
Fordum-----------	Severe: cutbanks cave, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: ponding, flooding, frost action.	Severe: ponding, flooding.
Ne---------------- Newlang	Severe: cutbanks cave, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: ponding, flooding.	Severe: too acid, ponding, excess humus.

Table 13.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
OrA: Orion	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, flooding, frost action.	Moderate: wetness, flooding.
Pa: Palms	Severe: excess humus, ponding.	Severe: subsides, flooding, ponding.	Severe: subsides, flooding, ponding.	Severe: subsides, flooding, ponding.	Severe: subsides, ponding, flooding.	Severe: ponding, flooding, excess humus.
Pt. Pits						
Pu: Ponycreek	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: too acid, ponding, excess humus.
Pv:						
Ponycreek	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: too acid, ponding, excess humus.
Dawsil	Severe: cutbanks cave, excess humus, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, frost action.	Severe: ponding, excess humus.
Pw: Psammaquents	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding.	Severe: wetness, flooding.
RkA: Rockdam	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Slight	Severe: too acid, droughty.
RoA: Rowley	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
SeB: Seaton	Slight	Slight	Slight	Moderate: slope.	Severe: low strength, frost action.	Slight.
SeC2: Seaton	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
SmB: Sebbo	Moderate: wetness.	Slight	Moderate: wetness.	Slight	Moderate: low strength, frost action.	Slight.
SnA: Sechler	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, frost action.	Severe: too acid.
SoA: Sooner	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.

Table 13.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
SpA: Sparta	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty, too sandy.
TrB: Tarr	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Severe: too acid.
TrC: Tarr	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: too acid.
TrF: Tarr	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: too acid, slope.
TtA: Tint	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Slight	Severe: droughty.
TuB: Tintson	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Slight	Moderate: droughty, too sandy.
TwA: Toddville	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
UdF: Udorthents	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
UfC2: Urne	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope, thin layer, area reclaim.
UfD2: Urne	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
UrF:						
Urne	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Council	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Vs:						
Veedum	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: too acid, ponding, excess humus.
Elm Lake	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, excess humus.
WmA: Whitehall	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, frost action.	Slight.

Table 14.--Sanitary Facilities

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "good," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
AbA: Absco	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy.
AcA:					
Absco	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy.
Northbend	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: wetness, too acid.
Ad: Adder	Severe: subsides, flooding, ponding.	Severe: seepage, flooding, excess humus.	Severe: flooding, seepage, ponding.	Severe: flooding, seepage, ponding.	Poor: seepage, too sandy, ponding.
ArA: Arenzville	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: wetness.
BeB: Bertrand	Moderate: percs slowly.	Severe: seepage.	Severe: seepage.	Slight	Fair: too clayey, thin layer.
BkA: Bilmod	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.
BlB: Bilson	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
BnB:					
Bilson	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Silverhill	Severe: poor filter.	Severe: seepage.	Severe: depth to rock, seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
BnC2:					
Bilson	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.

Table 14.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
BnC2:					
Elevasil	Severe: depth to rock, poor filter.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Poor: depth to rock, small stones.
BnD2:					
Bilson	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
Elevasil	Severe: depth to rock, poor filter, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: depth to rock, small stones, slope.
BoB Boone	Severe: depth to rock, poor filter.	Severe: seepage, depth to rock.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Poor: depth to rock, seepage, too sandy.
BoC Boone	Severe: depth to rock, poor filter.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Poor: depth to rock, seepage, too sandy.
BoF Boone	Severe: depth to rock, poor filter, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: depth to rock, seepage, too sandy.
BpF:					
Boone	Severe: depth to rock, poor filter, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: depth to rock, seepage, too sandy.
Elevasil	Severe: depth to rock, poor filter, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: depth to rock, small stones, slope.
Cd Citypoint	Severe: depth to rock, ponding, percs slowly.	Severe: seepage, depth to rock, excess humus.	Severe: depth to rock, seepage, ponding.	Severe: depth to rock, seepage, ponding.	Poor: depth to rock, ponding, excess humus.
CfA Coffton	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness, thin layer.
CoC2 Council	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
CpC2:					
Council	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
Bilson	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.

Table 14.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
CpD2:					
Council	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Bilson	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
CsD2, CsE:					
Council	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Seaton	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Da: Dawsil	Severe: subsides, ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, excess humus.	Severe: seepage, ponding.	Poor: ponding, excess humus.
DuA: Dunnville	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
ElB: Elevasil	Severe: depth to rock, poor filter.	Severe: seepage, depth to rock.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Poor: depth to rock, small stones.
ElC2: Elevasil	Severe: depth to rock, poor filter.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Poor: depth to rock, small stones.
ElD2: Elevasil	Severe: depth to rock, poor filter, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: depth to rock, small stones, slope.
Eo: Elm Lake	Severe: depth to rock, ponding, percs slowly.	Severe: seepage, depth to rock.	Severe: depth to rock, ponding, too sandy.	Severe: depth to rock, seepage, ponding.	Poor: depth to rock, seepage, too sandy.
Et: Ettrick	Severe: flooding, ponding, percs slowly.	Severe: seepage, flooding, ponding.	Severe: flooding, seepage, ponding.	Severe: flooding, ponding.	Poor: ponding.
FaA: Fairchild	Severe: depth to rock, wetness, percs slowly.	Severe: seepage, depth to rock, wetness.	Severe: depth to rock, wetness, too sandy.	Severe: depth to rock, seepage, wetness.	Poor: depth to rock, seepage, too sandy.
FeA:					
Fairchild	Severe: depth to rock, wetness, percs slowly.	Severe: seepage, depth to rock, wetness.	Severe: depth to rock, wetness, too sandy.	Severe: depth to rock, seepage, wetness.	Poor: depth to rock, seepage, too sandy.

Table 14.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
FeA:					
Elm Lake-----------	Severe: depth to rock, ponding, percs slowly.	Severe: seepage, depth to rock, excess humus.	Severe: depth to rock, ponding, too sandy.	Severe: depth to rock, seepage, ponding.	Poor: depth to rock, seepage, too sandy.
GaC2---------------- Gale	Severe: thin layer, seepage, poor filter.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: area reclaim, thin layer.
GaD2---------------- Gale	Severe: thin layer, seepage, poor filter.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: area reclaim, slope, thin layer.
GoB----------------- Gosil	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
GoC----------------- Gosil	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
HkB:					
Hiles--------------	Severe: depth to rock, wetness, percs slowly.	Severe: depth to rock, wetness.	Severe: depth to rock, wetness, too acid.	Severe: depth to rock.	Poor: depth to rock, too acid.
Kert---------------	Severe: depth to rock, wetness, percs slowly.	Severe: depth to rock, wetness.	Severe: depth to rock, wetness, too acid.	Severe: depth to rock, wetness.	Poor: depth to rock, wetness.
HnB----------------- Hixton	Severe: depth to rock, poor filter.	Severe: seepage, depth to rock.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Poor: depth to rock.
HnC2---------------- Hixton	Severe: depth to rock, poor filter.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Poor: depth to rock.
HnD2---------------- Hixton	Severe: depth to rock, poor filter, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: depth to rock, slope.
HpA----------------- Hoop	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
Ht------------------ Houghton	Severe: subsides, flooding, wetness.	Severe: seepage, flooding, excess humus.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: wetness, excess humus.
HuB----------------- Humbird	Severe: depth to rock, wetness, percs slowly.	Severe: depth to rock, wetness.	Severe: depth to rock, wetness.	Severe: depth to rock.	Poor: depth to rock.

Table 14.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
HxB:					
Humbird	Severe: depth to rock, wetness, percs slowly.	Severe: depth to rock, wetness.	Severe: depth to rock, wetness.	Severe: depth to rock.	Poor: depth to rock.
Merrillan	Severe: depth to rock, wetness, percs slowly.	Severe: depth to rock, wetness.	Severe: depth to rock, wetness, too clayey.	Severe: depth to rock, wetness.	Poor: depth to rock, too clayey, hard to pack.
ImA Impact	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
IrA Ironrun	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
IxA:					
Ironrun	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
Ponycreek	Severe: ponding, poor filter.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
IzB:					
Ironrun	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
Ponycreek	Severe: ponding, poor filter.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
Arbutus	Severe: depth to rock, poor filter.	Severe: seepage, depth to rock.	Severe: depth to rock, seepage, too sandy.	Severe: depth to rock, seepage.	Poor: depth to rock, seepage, too sandy.
JaA, JaB Jackson	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: wetness.	Fair: too clayey, wetness.
Ka Kalmarville	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, wetness, seepage.	Poor: wetness.
KeA Kert	Severe: depth to rock, wetness, percs slowly.	Severe: depth to rock, wetness.	Severe: depth to rock, wetness, too acid.	Severe: depth to rock, wetness.	Poor: depth to rock, wetness.

Table 14.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
LfC2: La Farge	Severe: thin layer, seepage.	Severe: seepage, slope.	Severe: seepage.	Moderate: seepage.	Poor: area reclaim, thin layer.
LfD2: La Farge	Severe: thin layer, seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: slope.	Poor: area reclaim, slope, thin layer.
LsD2:					
La Farge	Severe: thin layer, seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: slope.	Poor: area reclaim, slope, thin layer.
Seaton	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Lt: Loxley	Severe: subsides, ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, excess humus.	Severe: seepage, ponding.	Poor: ponding, excess humus, too acid.
LuB: Ludington	Severe: depth to rock, wetness, percs slowly.	Severe: seepage, depth to rock.	Severe: depth to rock, wetness.	Severe: depth to rock, seepage.	Poor: depth to rock, seepage, too sandy.
LxB:					
Ludington	Severe: depth to rock, wetness, percs slowly.	Severe: seepage, depth to rock.	Severe: depth to rock, wetness.	Severe: depth to rock, seepage.	Poor: depth to rock, seepage, too sandy.
Fairchild	Severe: depth to rock, wetness, percs slowly.	Severe: seepage, depth to rock, wetness.	Severe: depth to rock, wetness, too sandy.	Severe: depth to rock, seepage, wetness.	Poor: depth to rock, seepage, too sandy.
MaB: Mahtomedi	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
MbA: Majik	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
MmA: Merimod	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.
MnB: Merit	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
MoB:					
Merit	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.

Table 14.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
MoB:					
Gardenvale	Severe: poor filter.	Severe: seepage.	Severe: depth to rock, seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
MpA: Merrillan	Severe: depth to rock, wetness, percs slowly.	Severe: depth to rock, wetness.	Severe: depth to rock, wetness, too clayey.	Severe: depth to rock, wetness.	Poor: depth to rock, too clayey, hard to pack.
MrA:					
Merrillan	Severe: depth to rock, wetness, percs slowly.	Severe: depth to rock, wetness.	Severe: depth to rock, wetness, too clayey.	Severe: depth to rock, wetness.	Poor: depth to rock, too clayey, hard to pack.
Veedum	Severe: depth to rock, ponding, percs slowly.	Severe: depth to rock, ponding.	Severe: depth to rock, ponding, too acid.	Severe: depth to rock, ponding.	Poor: depth to rock, ponding, too acid.
MxA:					
Moppet	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: thin layer.
Fordum	Severe: flooding, ponding, poor filter.	Severe: seepage, flooding.	Severe: flooding, seepage, ponding.	Severe: flooding, seepage, ponding.	Poor: seepage, too sandy, small stones.
Ne: Newlang	Severe: flooding, ponding, poor filter.	Severe: seepage, flooding, excess humus.	Severe: flooding, seepage, ponding.	Severe: flooding, seepage, ponding.	Poor: seepage, too sandy, ponding.
OrA: Orion	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
Pa: Palms	Severe: subsides, flooding, ponding.	Severe: seepage, flooding, excess humus.	Severe: flooding, ponding, excess humus.	Severe: flooding, seepage, ponding.	Poor: ponding, excess humus.
Pt. Pits					
Pu: Ponycreek	Severe: ponding, poor filter.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
Pv:					
Ponycreek	Severe: ponding, poor filter.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.

Table 14.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Pv:					
Dawsil	Severe: subsides, ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, excess humus.	Severe: seepage, ponding.	Poor: ponding, excess humus.
Pw. Psammaquents	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: too sandy, wetness.
RkA. Rockdam	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.
RoA. Rowley	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: wetness.	Poor: wetness.
SeB. Seaton	Slight	Moderate: seepage, slope.	Slight	Slight	Good.
SeC2. Seaton	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
SmB. Sebbo	Severe: wetness.	Moderate: seepage, slope, wetness.	Moderate: wetness.	Slight	Good.
SnA. Sechler	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy, wetness.
SoA. Sooner	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
SpA. Sparta	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
TrB. Tarr	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
TrC. Tarr	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
TrF. Tarr	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
TtA. Tint	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.

Table 14.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
TuB----------------- Tintson	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: too sandy.	Severe: seepage.	Poor: seepage, too sandy.
TwA----------------- Toddville	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: wetness.	Fair: too clayey, wetness, thin layer.
UdF----------------- Udorthents	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
UfC2---------------- Urne	Severe: thin layer, seepage.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: area reclaim, thin layer.
UfD2---------------- Urne	Severe: thin layer, seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: area reclaim, slope, thin layer.
UrF:					
Urne----------------	Severe: thin layer, seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: area reclaim, slope, thin layer.
Council-------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Vs:					
Veedum--------------	Severe: depth to rock, ponding, percs slowly.	Severe: depth to rock, excess humus, ponding.	Severe: depth to rock, ponding, too acid.	Severe: depth to rock, ponding.	Poor: depth to rock, ponding, too acid.
Elm Lake------------	Severe: depth to rock, ponding, percs slowly.	Severe: seepage, depth to rock, excess humus.	Severe: depth to rock, ponding, too sandy.	Severe: depth to rock, seepage, ponding.	Poor: depth to rock, seepage, too sandy.
WmA----------------- Whitehall	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.

Table 15.--Construction Materials

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
AbA: Absco	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy.
AcA:				
Absco	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy.
Northbend	Fair: wetness.	Probable	Improbable: too sandy.	Poor: area reclaim, too acid.
Ad: Adder	Poor: wetness.	Probable	Improbable: too sandy.	Poor: excess humus, wetness.
ArA: Arenzville	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
BeB: Bertrand	Good	Probable	Improbable: too sandy.	Good.
BkA: Bilmod	Fair: wetness.	Probable	Improbable: too sandy.	Fair: small stones, area reclaim, thin layer.
BlB: Bilson	Good	Probable	Improbable: too sandy.	Fair: small stones, thin layer.
BnB:				
Bilson	Good	Probable	Improbable: too sandy.	Fair: small stones, thin layer.
Silverhill	Fair: depth to rock, thin layer.	Improbable: thin layer.	Improbable: too sandy.	Fair: thin layer.
BnC2:				
Bilson	Good	Probable	Improbable: too sandy.	Fair: small stones, thin layer, slope.
Elevasil	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
BnD2:				
Bilson	Fair: slope.	Probable	Improbable: too sandy.	Poor: slope.
Elevasil	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.

Table 15.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
BoB, BoC: Boone	Poor: depth to rock.	Improbable: thin layer.	Improbable: thin layer.	Poor: too sandy, small stones.
BoF: Boone	Poor: depth to rock, slope.	Improbable: thin layer.	Improbable: thin layer.	Poor: too sandy, small stones, slope.
BpF:				
Boone	Poor: depth to rock, slope.	Improbable: thin layer.	Improbable: thin layer.	Poor: too sandy, small stones, slope.
Elevasil	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Cd: Citypoint	Poor: depth to rock, wetness.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, wetness.
CfA: Coffton	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
CoC2: Council	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
CpC2:				
Council	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
Bilson	Good	Probable	Improbable: too sandy.	Fair: small stones, thin layer, slope.
CpD2:				
Council	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Bilson	Fair: slope.	Probable	Improbable: too sandy.	Poor: slope.
CsD2:				
Council	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Seaton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
CsE:				
Council	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Seaton	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.

Table 15.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Da------ Dawsil	Poor: wetness.	Probable------	Improbable: too sandy.	Poor: excess humus, area reclaim, wetness.
DuA------ Dunnville	Good------	Probable------	Probable------	Poor: small stones.
ElB, ElC2------ Elevasil	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
ElD2------ Elevasil	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Eo------ Elm Lake	Poor: depth to rock, wetness.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy, wetness.
Et------ Ettrick	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
FaA------ Fairchild	Poor: depth to rock, wetness.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy, wetness, too acid.
FeA:				
Fairchild------	Poor: depth to rock, wetness.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy, wetness, too acid.
Elm Lake------	Poor: depth to rock, wetness.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy, wetness.
GaC2------ Gale	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, thin layer, slope.
GaD2------ Gale	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
GoB, GoC------ Gosil	Good------	Probable------	Improbable: too sandy.	Fair: too sandy, small stones, thin layer.
HkB:				
Hiles------	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: too acid.
Kert------	Poor: depth to rock, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: depth to rock, small stones, thin layer.
HnB------ Hixton	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Fair: depth to rock, too clayey.

Table 15.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
HnC2------------------ Hixton	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Fair: depth to rock, too clayey, slope.
HnD2------------------ Hixton	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
HpA------------------- Hoop	Fair: wetness.	Probable-------------	Improbable: too sandy.	Fair: small stones, thin layer.
Ht-------------------- Houghton	Poor: wetness, low strength.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, wetness.
HuB------------------- Humbird	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Fair: depth to rock, small stones.
HxB:				
Humbird--------------	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Fair: depth to rock, small stones.
Merrillan------------	Poor: depth to rock, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness, too acid.
ImA------------------- Impact	Good------------------	Probable-------------	Improbable: too sandy.	Poor: too sandy.
IrA------------------- Ironrun	Poor: wetness.	Probable-------------	Improbable: too sandy.	Poor: too sandy, wetness, too acid.
IxA:				
Ironrun--------------	Poor: wetness.	Probable-------------	Improbable: too sandy.	Poor: too sandy, wetness, too acid.
Ponycreek------------	Poor: wetness.	Probable-------------	Improbable: too sandy.	Poor: too sandy, wetness, too acid.
IzB:				
Ironrun--------------	Poor: wetness.	Probable-------------	Improbable: too sandy.	Poor: too sandy, wetness, too acid.
Ponycreek------------	Poor: wetness.	Probable-------------	Improbable: too sandy.	Poor: too sandy, wetness, too acid.

Table 15.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
IzB:				
Arbutus	Poor: depth to rock.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy, small stones, too acid.
JaA, JaB Jackson	Fair: wetness.	Probable	Improbable: too sandy.	Fair: too clayey.
Ka Kalmarville	Poor: wetness.	Probable	Improbable: too sandy.	Poor: wetness.
KeA Kert	Poor: depth to rock, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: depth to rock, small stones, thin layer.
LfC2 La Farge	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, thin layer, slope.
LfD2 La Farge	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
LsD2:				
La Farge	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Seaton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Lt Loxley	Poor: wetness, low strength.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, wetness, too acid.
LuB Ludington	Poor: depth to rock.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy, too acid.
LxB:				
Ludington	Poor: depth to rock.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy, too acid.
Fairchild	Poor: depth to rock, wetness.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy, wetness, too acid.
MaB Mahtomedi	Good	Probable	Probable	Poor: too sandy, small stones, area reclaim.
MbA Majik	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy.

Table 15.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
MmA-------------------- Merimod	Fair: wetness.	Probable-------------	Improbable: too sandy.	Fair: area reclaim, too clayey, small stones.
MnB-------------------- Merit	Good-----------------	Probable-------------	Improbable: too sandy.	Fair: area reclaim, too clayey, small stones.
MoB:				
Merit-----------------	Good-----------------	Probable-------------	Improbable: too sandy.	Fair: area reclaim, too clayey, small stones.
Gardenvale-----------	Fair: depth to rock, thin layer.	Improbable: thin layer.	Improbable: too sandy.	Fair: small stones, thin layer.
MpA-------------------- Merrillan	Poor: depth to rock, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness, too acid.
MrA:				
Merrillan------------	Poor: depth to rock, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness, too acid.
Veedum---------------	Poor: depth to rock, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness, too acid.
MxA:				
Moppet---------------	Fair: wetness.	Probable-------------	Probable-------------	Poor: area reclaim.
Fordum---------------	Poor: wetness.	Probable-------------	Probable-------------	Poor: small stones, area reclaim, wetness.
Ne--------------------- Newlang	Poor: wetness.	Probable-------------	Improbable: too sandy.	Poor: too sandy, wetness.
OrA-------------------- Orion	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Pa--------------------- Palms	Poor: wetness.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, wetness.
Pt. Pits				
Pu--------------------- Ponycreek	Poor: wetness.	Probable-------------	Improbable: too sandy.	Poor: too sandy, wetness, too acid.

Table 15.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Pv:				
Ponycreek	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness, too acid.
Dawsil	Poor: wetness.	Probable	Probable	Poor: excess humus, area reclaim, wetness.
Pw. Psammaquents	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy, wetness.
RkA. Rockdam	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, too acid.
RoA. Rowley	Fair: wetness.	Probable	Improbable: too sandy.	Fair: too clayey.
SeB. Seaton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
SeC2. Seaton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
SmB. Sebbo	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
SnA. Sechler	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, small stones.
SoA. Sooner	Fair: wetness.	Probable	Improbable: too sandy.	Fair: area reclaim, too clayey, small stones.
SpA. Sparta	Good	Probable	Improbable: too sandy.	Poor: too sandy.
TrB, TrC. Tarr	Good	Probable	Improbable: too sandy.	Poor: too sandy, too acid.
TrF. Tarr	Poor: slope.	Probable	Improbable: too sandy.	Poor: too sandy, too acid, slope.
TtA. Tint	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy.
TuB. Tintson	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy.
TwA. Toddville	Fair: wetness.	Probable	Improbable: too sandy.	Good.

Table 15.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
UdF: Udorthents	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
UfC2: Urne	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
UfD2: Urne	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
UrF:				
Urne	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Council	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Vs:				
Veedum	Poor: depth to rock, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness, too acid.
Elm Lake	Poor: depth to rock, wetness.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy, wetness.
WmA: Whitehall	Good	Probable	Improbable: too sandy.	Fair: thin layer.

Table 16.--Water Management

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
AbA---------------- Absco	Severe: seepage.	Severe: seepage, piping.	Flooding, cutbanks cave.	Wetness, droughty, fast intake.	Wetness, too sandy, soil blowing.	Droughty.
AcA:						
Absco-------------	Severe: seepage.	Severe: seepage, piping.	Flooding, cutbanks cave.	Wetness, droughty, fast intake.	Wetness, too sandy, soil blowing.	Droughty.
Northbend---------	Severe: seepage.	Severe: piping, wetness.	Flooding, frost action, too acid.	Wetness, rooting depth, flooding.	Erodes easily, wetness.	Wetness, erodes easily, rooting depth.
Ad----------------- Adder	Severe: seepage.	Severe: seepage, piping, ponding.	Ponding, flooding, subsides.	Ponding, soil blowing, rooting depth.	Ponding, too sandy, soil blowing.	Wetness, rooting depth.
ArA---------------- Arenzville	Moderate: seepage.	Severe: piping.	Deep to water	Erodes easily, flooding.	Erodes easily	Erodes easily.
BeB---------------- Bertrand	Severe: seepage.	Moderate: thin layer, piping.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
BkA---------------- Bilmod	Severe: seepage.	Severe: seepage, piping.	Cutbanks cave	Wetness, droughty, soil blowing.	Wetness, too sandy, soil blowing.	Droughty.
BlB---------------- Bilson	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, droughty, soil blowing.	Too sandy, soil blowing.	Droughty.
BnB:						
Bilson------------	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, droughty, soil blowing.	Too sandy, soil blowing.	Droughty.
Silverhill--------	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, droughty, soil blowing.	Too sandy, soil blowing.	Droughty.
BnC2, BnD2:						
Bilson------------	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Slope, droughty, soil blowing.	Slope, too sandy, soil blowing.	Slope, droughty.
Elevasil----------	Severe: seepage, slope.	Severe: piping.	Deep to water	Slope, droughty, soil blowing.	Slope, depth to rock, soil blowing.	Slope, droughty, depth to rock.
BoB---------------- Boone	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, droughty, fast intake.	Depth to rock, too sandy.	Droughty, depth to rock.

Table 16.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
BoC, BoF----------- Boone	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Slope, droughty, fast intake.	Slope, depth to rock, too sandy.	Slope, droughty, depth to rock.
BpF:						
Boone------------	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Slope, droughty, fast intake.	Slope, depth to rock, too sandy.	Slope, droughty, depth to rock.
Elevasil---------	Severe: seepage, slope.	Severe: piping.	Deep to water	Slope, droughty, soil blowing.	Slope, depth to rock, soil blowing.	Slope, droughty, depth to rock.
Cd---------------- Citypoint	Severe: seepage.	Severe: excess humus, ponding.	Ponding, percs slowly, depth to rock.	Ponding, percs slowly, depth to rock.	Depth to rock, ponding.	Wetness, depth to rock, rooting depth.
CfA--------------- Coffton	Moderate: seepage.	Severe: piping, wetness.	Flooding, frost action.	Wetness, flooding.	Erodes easily, wetness.	Wetness, erodes easily.
CoC2-------------- Council	Severe: slope.	Severe: piping.	Deep to water	Slope----------	Slope, erodes easily.	Slope, erodes easily.
CpC2, CpD2:						
Council----------	Severe: slope.	Severe: piping.	Deep to water	Slope, soil blowing.	Slope----------	Slope.
Bilson-----------	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Slope, droughty, soil blowing.	Slope, too sandy, soil blowing.	Slope, droughty.
CsD2, CsE:						
Council----------	Severe: slope.	Severe: piping.	Deep to water	Slope----------	Slope, erodes easily.	Slope, erodes easily.
Seaton-----------	Severe: slope.	Severe: piping.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
Da---------------- Dawsil	Severe: seepage.	Severe: excess humus, ponding.	Ponding, subsides, frost action.	Ponding--------	Ponding--------	Wetness.
DuA--------------- Dunnville	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, soil blowing.	Too sandy, soil blowing.	Droughty.
ElB--------------- Elevasil	Severe: seepage.	Severe: piping.	Deep to water	Slope, droughty, soil blowing.	Depth to rock, soil blowing.	Droughty, depth to rock.
ElC2, ElD2-------- Elevasil	Severe: seepage, slope.	Severe: piping.	Deep to water	Slope, droughty, soil blowing.	Slope, depth to rock, soil blowing.	Slope, droughty, depth to rock.
Eo---------------- Elm Lake	Severe: seepage.	Severe: seepage, piping, ponding.	Ponding, depth to rock, cutbanks cave.	Ponding, droughty, fast intake.	Depth to rock, erodes easily, ponding.	Wetness, erodes easily, droughty.
Et---------------- Ettrick	Moderate: seepage.	Severe: ponding.	Flooding, frost action, ponding.	Flooding, ponding.	Ponding--------	Wetness.

Table 16.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
FaA----------------- Fairchild	Severe: seepage.	Severe: seepage, piping, wetness.	Depth to rock, cutbanks cave, too acid.	Wetness, droughty, fast intake.	Depth to rock, wetness, too sandy.	Wetness, droughty, depth to rock.
FeA:						
Fairchild---------	Severe: seepage.	Severe: seepage, piping, wetness.	Depth to rock, cutbanks cave, too acid.	Wetness, droughty, fast intake.	Depth to rock, wetness, too sandy.	Wetness, droughty, depth to rock.
Elm Lake----------	Severe: seepage.	Severe: seepage, piping, ponding.	Ponding, depth to rock, cutbanks cave.	Ponding---------	Depth to rock, erodes easily, ponding.	Wetness, erodes easily.
GaC2, GaD2--------- Gale	Severe: seepage, slope.	Severe: thin layer.	Deep to water	Slope, thin layer, erodes easily.	Slope, area reclaim, erodes easily.	Slope, erodes easily, area reclaim.
GoB----------------- Gosil	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Droughty.
GoC----------------- Gosil	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.
HkB:						
Hiles-------------	Moderate: seepage, depth to rock, slope.	Severe: thin layer.	Depth to rock, slope, too acid.	Slope, wetness, depth to rock.	Depth to rock, erodes easily.	Erodes easily, depth to rock.
Kert--------------	Moderate: seepage, depth to rock.	Severe: thin layer.	Depth to rock, frost action.	Wetness, depth to rock.	Depth to rock, erodes easily, wetness.	Wetness, erodes easily, depth to rock.
HnB----------------- Hixton	Severe: seepage.	Severe: thin layer.	Deep to water	Slope, depth to rock.	Depth to rock	Depth to rock.
HnC2, HnD2--------- Hixton	Severe: seepage, slope.	Severe: thin layer.	Deep to water	Slope, depth to rock.	Slope, depth to rock.	Slope, depth to rock.
HpA----------------- Hoop	Severe: seepage.	Severe: seepage, piping, wetness.	Cutbanks cave	Wetness, droughty, soil blowing.	Wetness, too sandy, soil blowing.	Wetness, droughty, rooting depth.
Ht------------------ Houghton	Severe: seepage.	Severe: excess humus, wetness.	Flooding, subsides, frost action.	Wetness, soil blowing, flooding.	Wetness, soil blowing.	Wetness.
HuB----------------- Humbird	Moderate: depth to rock, slope.	Severe: piping.	Percs slowly, depth to rock, slope.	Slope, wetness, droughty.	Depth to rock, wetness.	Droughty, depth to rock.
HxB:						
Humbird-----------	Moderate: depth to rock, slope.	Severe: piping.	Percs slowly, depth to rock, slope.	Slope, wetness, droughty.	Depth to rock, wetness.	Droughty, depth to rock.

Table 16.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
HxB:						
Merrillan	Moderate: seepage, depth to rock.	Severe: thin layer, wetness.	Percs slowly, depth to rock, frost action.	Wetness, soil blowing.	Depth to rock, wetness, soil blowing.	Wetness, depth to rock, percs slowly.
ImA Impact	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake.	Too sandy, soil blowing.	Droughty.
IrA Ironrun	Severe: seepage.	Severe: seepage, piping, wetness.	Cutbanks cave, too acid.	Wetness, droughty, fast intake.	Wetness, too sandy, soil blowing.	Wetness, droughty.
IxA:						
Ironrun	Severe: seepage.	Severe: seepage, piping, wetness.	Cutbanks cave, too acid.	Wetness, droughty, fast intake.	Wetness, too sandy, soil blowing.	Wetness, droughty.
Ponycreek	Severe: seepage.	Severe: seepage, piping, ponding.	Ponding, cutbanks cave, too acid.	Ponding, droughty, soil blowing.	Ponding, too sandy, soil blowing.	Wetness, droughty.
IzB:						
Ironrun	Severe: seepage.	Severe: seepage, piping, wetness.	Cutbanks cave, too acid.	Wetness, droughty, fast intake.	Wetness, too sandy, soil blowing.	Wetness, droughty.
Ponycreek	Severe: seepage.	Severe: seepage, piping, ponding.	Ponding, cutbanks cave, too acid.	Ponding, droughty, soil blowing.	Ponding, too sandy, soil blowing.	Wetness, droughty.
Arbutus	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, droughty, fast intake.	Depth to rock, too sandy, soil blowing.	Droughty, depth to rock.
JaA Jackson	Severe: seepage.	Moderate: thin layer, piping, wetness.	Frost action	Wetness, erodes easily.	Erodes easily, wetness.	Erodes easily.
JaB Jackson	Severe: seepage.	Moderate: thin layer, piping, wetness.	Frost action, slope.	Slope, wetness, erodes easily.	Erodes easily, wetness.	Erodes easily.
Ka Kalmarville	Severe: seepage.	Severe: piping, wetness.	Flooding, frost action.	Wetness, flooding.	Wetness	Wetness.
KeA Kert	Moderate: seepage, depth to rock.	Severe: thin layer.	Depth to rock, frost action.	Wetness, depth to rock.	Depth to rock, erodes easily, wetness.	Wetness, erodes easily, depth to rock.
LfC2, LfD2 La Farge	Severe: slope.	Severe: thin layer.	Deep to water	Slope, thin layer, rooting depth.	Slope, area reclaim, erodes easily.	Slope, erodes easily, area reclaim.

Table 16.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
LsD2:						
La Farge	Severe: slope.	Severe: thin layer.	Deep to water	Slope, thin layer, rooting depth.	Slope, area reclaim, erodes easily.	Slope, erodes easily, area reclaim.
Seaton	Severe: slope.	Severe: piping.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
Lt Loxley	Severe: seepage.	Severe: excess humus, ponding.	Ponding, subsides, frost action.	Ponding, too acid.	Ponding	Wetness.
LuB Ludington	Severe: seepage.	Severe: seepage, piping.	Depth to rock, slope, cutbanks cave.	Slope, wetness, droughty.	Depth to rock, wetness.	Droughty, depth to rock.
LxB:						
Ludington	Severe: seepage.	Severe: seepage, piping.	Depth to rock, slope, cutbanks cave.	Slope, wetness, droughty.	Depth to rock, wetness.	Droughty, depth to rock.
Fairchild	Severe: seepage.	Severe: seepage, piping, wetness.	Depth to rock, cutbanks cave, too acid.	Wetness, droughty, fast intake.	Depth to rock, wetness, too sandy.	Wetness, droughty, depth to rock.
MaB Mahtomedi	Severe: seepage.	Severe: seepage.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Droughty, rooting depth.
MbA Majik	Severe: seepage.	Severe: seepage, piping, wetness.	Cutbanks cave	Wetness, droughty, fast intake.	Wetness, too sandy, soil blowing.	Wetness, droughty.
MmA Merimod	Severe: seepage.	Severe: seepage, piping.	Cutbanks cave	Wetness, rooting depth.	Erodes easily, wetness, too sandy.	Erodes easily, rooting depth.
MnB Merit	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, rooting depth.	Erodes easily, too sandy.	Erodes easily, rooting depth.
MoB:						
Merit	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, rooting depth.	Erodes easily, too sandy.	Erodes easily, rooting depth.
Gardenvale	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, erodes easily.	Erodes easily, too sandy.	Erodes easily.
MpA Merrillan	Moderate: seepage, depth to rock.	Severe: thin layer, wetness.	Percs slowly, depth to rock, frost action.	Wetness, soil blowing.	Depth to rock, wetness, soil blowing.	Wetness, depth to rock, percs slowly.
MrA:						
Merrillan	Moderate: seepage, depth to rock.	Severe: thin layer, wetness.	Percs slowly, depth to rock, frost action.	Wetness, soil blowing.	Depth to rock, wetness, soil blowing.	Wetness, depth to rock, percs slowly.

Table 16.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
MrA:						
Veedum	Moderate: seepage, depth to rock.	Severe: thin layer, ponding.	Ponding, depth to rock, frost action.	Ponding, depth to rock.	Depth to rock, erodes easily, ponding.	Wetness, erodes easily, depth to rock.
MxA:						
Moppet	Severe: seepage.	Severe: piping.	Flooding	Wetness, soil blowing, rooting depth.	Wetness, soil blowing.	Rooting depth.
Fordum	Severe: seepage.	Severe: seepage, piping, ponding.	Ponding, flooding, frost action.	Ponding, droughty, flooding.	Erodes easily, ponding, too sandy.	Wetness, erodes easily, droughty.
Ne Newlang	Severe: seepage.	Severe: seepage, piping, ponding.	Ponding, flooding, cutbanks cave.	Ponding, droughty, soil blowing.	Ponding, too sandy, soil blowing.	Wetness, droughty.
OrA Orion	Moderate: seepage.	Severe: piping, wetness.	Flooding, frost action.	Wetness	Erodes easily, wetness.	Wetness, erodes easily.
Pa Palms	Severe: seepage.	Severe: excess humus, ponding.	Ponding, flooding, subsides.	Ponding, soil blowing.	Erodes easily, ponding, soil blowing.	Wetness, erodes easily, rooting depth.
Pt. Pits						
Pu Ponycreek	Severe: seepage.	Severe: seepage, piping, ponding.	Ponding, cutbanks cave, too acid.	Ponding, droughty, soil blowing.	Ponding, too sandy, soil blowing.	Wetness, droughty.
Pv:						
Ponycreek	Severe: seepage.	Severe: seepage, piping, ponding.	Ponding, cutbanks cave, too acid.	Ponding, droughty, soil blowing.	Ponding, too sandy, soil blowing.	Wetness, droughty.
Dawsil	Severe: seepage.	Severe: excess humus, ponding.	Ponding, subsides, frost action.	Ponding	Ponding	Wetness.
Pw Psammaquents	Severe: seepage.	Severe: wetness.	Flooding, cutbanks cave.	Wetness, droughty, fast intake.	Wetness, too sandy.	Wetness, droughty.
RkA Rockdam	Severe: seepage.	Severe: seepage, piping.	Cutbanks cave, too acid.	Wetness, droughty, fast intake.	Wetness, too sandy, soil blowing.	Droughty.
RoA Rowley	Severe: seepage.	Severe: wetness.	Frost action	Wetness	Erodes easily, wetness.	Wetness, erodes easily.
SeB Seaton	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.

Table 16.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
SeC2: Seaton	Severe: slope.	Severe: piping.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
SmB: Sebbo	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope	Favorable	Favorable.
SnA: Sechler	Severe: seepage.	Severe: seepage, piping, wetness.	Flooding, frost action, cutbanks cave.	Wetness, droughty, flooding.	Wetness, too sandy.	Wetness, droughty.
SoA: Sooner	Severe: seepage.	Severe: seepage, piping, wetness.	Cutbanks cave	Wetness, rooting depth.	Erodes easily, wetness, too sandy.	Wetness, erodes easily, rooting depth.
SpA: Sparta	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake.	Too sandy, soil blowing.	Droughty.
TrB: Tarr	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Droughty.
TrC, TrF: Tarr	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.
TtA: Tint	Severe: seepage.	Severe: seepage, piping.	Cutbanks cave	Wetness, droughty.	Wetness, too sandy, soil blowing.	Droughty.
TuB: Tintson	Severe: seepage.	Severe: seepage, piping.	Slope, cutbanks cave.	Slope, wetness, droughty.	Wetness, too sandy, soil blowing.	Droughty.
TwA: Toddville	Severe: seepage.	Moderate: thin layer, wetness.	Frost action	Wetness	Erodes easily, wetness.	Erodes easily.
UdF: Udorthents	Severe: slope.	Slight	Deep to water	Slope	Slope	Slope.
UfC2, UfD2: Urne	Severe: seepage, slope.	Severe: piping.	Deep to water	Slope, thin layer.	Slope, area reclaim, erodes easily.	Slope, erodes easily.
UrF:						
Urne	Severe: seepage, slope.	Severe: piping.	Deep to water	Slope, thin layer.	Slope, area reclaim, erodes easily.	Slope, erodes easily.
Council	Severe: slope.	Severe: piping.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Vs:						
Veedum	Moderate: seepage, depth to rock.	Severe: thin layer, ponding.	Ponding, depth to rock, frost action.	Ponding, soil blowing, depth to rock.	Depth to rock, erodes easily, ponding.	Wetness, erodes easily, depth to rock.

Table 16.--Water Management--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
Vs:						
Elm Lake	Severe: seepage.	Severe: seepage, piping, ponding.	Ponding, depth to rock, cutbanks cave.	Ponding	Depth to rock, erodes easily, ponding.	Wetness, erodes easily.
WmA Whitehall	Severe: seepage.	Severe: seepage, piping.	Deep to water	Favorable	Erodes easily, too sandy.	Erodes easily.

Table 17.--Engineering Index Properties

(The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated)

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 10 inches	Frag- ments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
AbA----------- Absco	0-4	Loamy sand----	SM	A-2-4	0	0	90-100	85-100	50-75	15-30	---	NP
	4-14	Sand, loamy sand.	SM, SP-SM	A-2-4, A-1, A-3	0	0	90-100	85-100	45-65	5-30	---	NP
	14-42	Stratified sand to loam.	SP-SM, SM	A-2-4, A-3	0	0	90-100	85-100	55-70	5-25	---	NP
	42-60	Sand, coarse sand, loamy sand.	SP-SM, SP, SM	A-1, A-3, A-2-4	0	0	90-100	85-100	45-65	0-15	---	NP
AcA:												
Absco--------	0-4	Loamy sand----	SM	A-2-4	0	0	90-100	85-100	50-75	15-30	---	NP
	4-14	Sand, loamy sand.	SM, SP-SM	A-2-4, A-1, A-3	0	0	90-100	85-100	45-65	5-30	---	NP
	14-42	Stratified sand to loam.	SP-SM, SM	A-2-4, A-3	0	0	90-100	85-100	55-70	5-25	---	NP
	42-60	Sand, coarse sand, loamy sand.	SP-SM, SP, SM	A-1, A-3, A-2-4	0	0	90-100	85-100	45-65	0-15	---	NP
Northbend----	0-7	Silt loam-----	ML, CL-ML	A-4	0	0	95-100	90-100	55-100	40-80	<25	NP-7
	7-34	Silt loam, loam, sandy loam.	ML, CL, SM, SC	A-4	0	0	95-100	90-100	45-100	30-75	<28	NP-9
	34-36	Loamy fine sand, loamy sand.	SM	A-1	0	0	95-100	90-100	35-95	15-50	---	NP
	36-60	Sand, fine sand.	SP, SP-SM, SM	A-1, A-3	0	0	95-100	90-100	25-85	4-35	---	NP
Ad------------ Adder	0-22	Muck----------	PT	A-8	---	---	---	---	---	---	---	---
	22-60	Sand, coarse sand, fine sand.	SP, SM	A-2, A-3, A-1	0	0	100	95-100	40-80	0-35	---	NP
ArA----------- Arenzville	0-32	Silt loam-----	ML, CL-ML, CL	A-4	0	0	100	100	95-100	80-95	20-30	4-10
	32-42	Silt loam-----	CL	A-6, A-7	0	0	100	100	90-100	85-95	30-45	10-20
	42-60	Silt loam-----	CL, CL-ML	A-4	0	0	75-100	75-100	75-100	70-95	20-30	5-10
BeB----------- Bertrand	0-9	Silt loam-----	CL-ML, CL	A-4, A-6	0	0	100	100	90-100	85-90	25-35	6-15
	9-43	Silt loam, silty clay loam.	CL	A-6, A-4	0	0	100	100	90-100	85-95	25-40	7-20
	43-48	Sandy loam, fine sandy loam, loam.	CL-ML, SC-SM, CL, SC	A-4	0	0	100	100	80-95	35-75	<30	4-10
	48-60	Sand, fine sand, loamy sand.	SP-SM, SM	A-2, A-3	0	0	95-100	95-100	50-80	5-35	---	NP
BkA----------- Bilmod	0-9	Sandy loam----	SM, SC-SM	A-4, A-2-4	0	0	95-100	90-100	55-80	25-50	15-25	NP-7
	9-24	Sandy loam, loam, fine sandy loam.	SM, SC, CL, ML	A-4, A-2-4	0	0-2	95-100	90-100	55-90	25-65	<28	NP-9
	24-32	Loamy sand, sand.	SM, SP-SM	A-2-4, A-3, A-1-b	0	0-2	80-100	75-100	20-75	5-30	<21	NP-4
	32-60	Sand----------	SM, SP-SM	A-1-b, A-3	0	0-2	80-100	75-100	20-70	5-25	---	NP

Table 17.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 10 inches	Frag- ments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
BlB----------- Bilson	0-8	Sandy loam----	SM, SC-SM	A-4, A-2-4	0	0	80-100	75-100	45-90	20-50	15-25	NP-7
	8-32	Sandy loam, fine sandy loam, loam.	SM, SC, CL, ML	A-4, A-2-4	0	0	80-100	75-100	45-95	20-65	<28	NP-9
	32-60	Sand----------	SM, SP-SM	A-1-b, A-3	0	0	80-100	75-100	20-70	5-25	---	NP
BnB: Bilson-------	0-8	Sandy loam----	SM, SC-SM	A-4, A-2-4	0	0	80-100	75-100	45-90	20-50	15-25	NP-7
	8-32	Sandy loam, fine sandy loam, loam.	SM, SC, CL, ML	A-4, A-2-4	0	0	80-100	75-100	45-95	20-65	<28	NP-9
	32-60	Sand----------	SM, SP-SM	A-1-b, A-3	0	0	80-100	75-100	20-70	5-25	---	NP
Silverhill---	0-8	Sandy loam----	SM, SC	A-2-4, A-4	0	0	100	100	60-80	30-50	<26	NP-8
	8-26	Sandy loam, fine sandy loam.	SC-SM, SC, CL, CL-ML	A-2-4, A-4	0	0	100	100	60-95	30-80	21-28	4-9
	26-32	Loamy sand, sand.	SM, SP-SM	A-1-b, A-2-4, A-3	0	0	100	100	30-75	5-35	<21	NP-4
	32-50	Sand----------	SM, SP-SM	A-1-b, A-3, A-2-4	0	0	80-100	75-100	30-75	5-35	<21	NP-4
	50-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---	---
BnC2, BnD2: Bilson-------	0-8	Sandy loam----	SM, SC-SM	A-4, A-2-4	0	0	80-100	75-100	45-90	20-50	15-25	NP-7
	8-32	Sandy loam, fine sandy loam, loam.	SM, SC, CL, ML	A-4, A-2-4	0	0	80-100	75-100	45-95	20-65	<28	NP-9
	32-60	Sand----------	SM, SP-SM	A-1-b, A-3	0	0	80-100	75-100	20-70	5-25	---	NP
Elevasil-----	0-3	Sandy loam----	SM, SC-SM	A-4, A-2-4	0	0-9	80-100	75-100	45-80	20-45	18-25	3-7
	3-27	Sandy loam, loam, fine sandy loam.	SC, SC-SM, CL, CL-ML	A-4, A-2-4, A-1-b	0	0-9	80-100	75-100	45-80	20-55	21-28	4-9
	27-31	Loamy sand, loamy fine sand, channery sand.	SP, SM, SP-SM	A-2-4, A-3, A-1-b	0	0-9	80-100	50-100	15-70	4-35	<21	NP-4
	31-39	Sand, fine sand, channery sand.	SP, SM, SP-SM	A-2-4, A-3, A-1-b	0	0-9	80-100	50-100	10-60	2-20	<18	NP-3
	39-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---	---

Table 17.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 10 inches	Frag- ments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
BoB, BoC, BoF-- Boone	0-3	Sand----------	SM, SP-SM	A-2, A-3, A-1	0	0-9	80-100	75-100	40-80	5-35	---	NP
	3-8	Sand, fine sand, loamy fine sand.	SM, SP-SM, SP	A-2, A-3, A-1	0	0-9	80-100	75-100	35-75	2-35	---	NP
	8-35	Fine sand, channery sand.	SM, SP-SM, SP	A-2, A-3, A-1	0	0-9	55-100	50-100	20-75	1-35	---	NP
	35-61	Weathered bedrock.	---	---	---	---	---	---	20-75	1-35	---	---
BpF:												
Boone---------	0-3	Sand----------	SM, SP-SM	A-2, A-3, A-1	0	0-9	80-100	75-100	40-80	5-35	---	NP
	3-8	Sand, fine sand, loamy fine sand.	SM, SP-SM, SP	A-2, A-3, A-1	0	0-9	80-100	75-100	35-75	2-35	---	NP
	8-35	Fine sand, channery sand.	SM, SP-SM, SP	A-2, A-3, A-1	0	0-9	55-100	50-100	20-75	1-35	---	NP
	35-61	Weathered bedrock.	---	---	---	---	---	---	20-75	1-35	---	---
Elevasil-----	0-3	Sandy loam----	SM, SC-SM	A-4, A-2-4	0	0-9	80-100	75-100	45-80	20-45	18-25	3-7
	3-27	Sandy loam, loam, fine sandy loam.	SC, SC-SM, CL, CL-ML	A-4, A-2-4, A-1-b	0	0-9	80-100	75-100	45-80	20-55	21-28	4-9
	27-31	Loamy sand, loamy fine sand, channery sand.	SP, SM, SP-SM	A-2-4, A-3, A-1-b	0	0-9	80-100	50-100	15-70	4-35	<21	NP-4
	31-39	Sand, fine sand, channery sand.	SP, SM, SP-SM	A-2-4, A-3, A-1-b	0	0-9	80-100	50-100	10-60	2-20	<18	NP-3
	39-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---	---
Cd------------ Citypoint	0-12	Mucky peat----	PT	A-8	0	0	---	---	---	---	---	---
	12-26	Muck----------	PT	A-8	0	0	---	---	---	---	---	---
	26-34	Sand, sandy loam, silty clay.	SP, SM, SC-SM, CL	A-1, A-2-4, A-6	0	0	80-100	75-100	20-100	4-80	0-55	NP-30
	34-60	Weathered bedrock, unweathered bedrock.	---	---	---	---	---	---	---	---	---	---
CfA----------- Coffton	0-11	Silt loam-----	CL, CL-ML	A-4, A-6	0	0	100	100	90-100	85-100	25-40	5-20
	11-38	Silt loam-----	ML, CL-ML, CL	A-4	0	0	100	100	90-100	85-95	20-35	3-10
	38-60	Stratified silt loam to fine sand.	ML, SM, SC, CL	A-4, A-2	0	0	100	90-100	85-100	30-85	15-30	NP-10

Table 17.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 10 inches	Fragments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
CoC2---------- Council	0-7	Loam----------	ML, SM	A-4	0	0	80-100	75-100	55-100	45-85	<20	NP-4
	7-45	Loam, silt loam, sandy loam.	CL, CL-ML, SC, SC-SM	A-4	0	0	80-100	75-100	50-100	35-85	20-28	4-9
	45-60	Sandy loam, loam, silt loam.	ML, CL, SM, SC	A-4, A-2	0	0	80-100	75-100	50-100	30-85	<28	NP-9
CpC2, CpD2: Council------	0-9	Fine sandy loam.	ML, SM	A-4, A-2, A-1	0	0	80-100	75-100	45-90	20-55	<20	NP-4
	9-41	Loam, silt loam, sandy loam.	CL, CL-ML, SC, SC-SM	A-4	0	0	80-100	75-100	50-100	35-85	20-28	4-9
	41-60	Sandy loam, loam, silt loam.	ML, CL, SM, SC	A-4, A-2	0	0	80-100	75-100	50-100	30-85	<28	NP-9
Bilson--------	0-8	Fine sandy loam.	SM, SC-SM	A-4, A-2-4	0	0	80-100	75-100	45-90	20-50	15-25	NP-7
	8-27	Sandy loam, fine sandy loam, loam.	SM, SC, CL, ML	A-4, A-2-4	0	0	80-100	75-100	45-95	20-65	<28	NP-9
	27-60	Sand----------	SM, SP-SM	A-1-b, A-3	0	0	80-100	75-100	20-70	5-25	---	NP
CsD2: Council------	0-7	Loam----------	ML, SM	A-4	0	0	80-100	75-100	55-100	45-85	<20	NP-4
	7-45	Loam, silt loam, sandy loam.	CL, CL-ML, SC, SC-SM	A-4	0	0	80-100	75-100	50-100	35-85	20-28	4-9
	45-60	Sandy loam, loam, silt loam.	ML, CL, SM, SC	A-4, A-2	0	0	80-100	75-100	50-100	30-85	<28	NP-9
Seaton--------	0-9	Silt loam-----	CL, CL-ML	A-4, A-6	0	0	100	100	100	95-100	20-35	5-15
	9-46	Silt loam-----	CL, CL-ML	A-6, A-4, A-7	0	0	100	100	100	90-100	25-45	5-25
	46-60	Silt loam-----	CL, CL-ML	A-4, A-6	0	0	100	100	100	90-100	25-40	5-20
CsE: Council------	0-7	Loam----------	ML, SM	A-4	0	0	80-100	75-100	55-100	45-85	<20	NP-4
	7-45	Loam, silt loam, sandy loam.	CL, CL-ML, SC, SC-SM	A-4	0	0	80-100	75-100	50-100	35-85	20-28	4-9
	45-60	Sandy loam, loam, silt loam.	ML, CL, SM, SC	A-4, A-2	0	0	80-100	75-100	50-100	30-85	<28	NP-9
Seaton--------	0-9	Silt loam-----	CL, CL-ML, ML	A-4, A-6, A-7	0	0	100	100	100	95-100	20-45	5-20
	9-38	Silt loam-----	CL, CL-ML	A-6, A-4, A-7	0	0	100	100	100	90-100	25-45	5-25
	38-60	Silt loam-----	CL, CL-ML	A-4, A-6	0	0	100	100	100	90-100	25-40	5-20
Da------------ Dawsil	0-20	Mucky peat----	PT	A-8	0	0	---	---	---	---	---	---
	20-40	Muck----------	PT	A-8	0	0	---	---	---	---	---	---
	40-60	Sand, coarse sand, loamy sand.	SC-SM, SM, SC, SP-SM	A-2, A-3, A-1, A-4	0	0	85-100	75-100	25-75	5-35	<20	NP-10

Table 17.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 10 inches	Fragments 3-10 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO			4	10	40	200		
	In				Pct	Pct					Pct	
DuA----------- Dunnville	0-16	Sandy loam----	SM, ML	A-2, A-4	0	0	95-100	90-100	55-95	30-65	<20	NP-4
	16-24	Loam, sandy loam, fine sandy loam.	CL, CL-ML, SC, SC-SM	A-2, A-4	0	0	95-100	90-100	55-95	30-75	20-28	4-9
	24-27	Loamy sand, loamy coarse sand.	ML	A-2, A-4	0	0	95-100	90-100	45-85	20-55	<20	NP-4
	27-60	Sand, gravelly coarse sand, fine sand.	SP, SM, GP, GM	A-2, A-3, A-1	0	0	50-100	50-100	25-80	1-20	---	NP
ElB, ElC2, ElD2--------- Elevasil	0-3	Sandy loam----	SM, SC-SM	A-4, A-2-4	0	0-9	80-100	75-100	45-80	20-45	18-25	3-7
	3-27	Sandy loam, loam, fine sandy loam.	SC, SC-SM, CL, CL-ML	A-4, A-2-4, A-1-b	0	0-9	80-100	75-100	45-80	20-55	21-28	4-9
	27-31	Loamy sand, loamy fine sand, channery sand.	SP, SM, SP-SM	A-2-4, A-3, A-1-b	0	0-9	80-100	50-100	15-70	4-35	<21	NP-4
	31-39	Sand, fine sand, channery sand.	SP, SM, SP-SM	A-2-4, A-3, A-1-b	0	0-9	80-100	50-100	10-60	2-20	<18	NP-3
	39-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---	---
Eo------------ Elm Lake	0-4	Mucky sand----	SM	A-2, A-1	0	0	80-100	75-100	40-75	15-35	---	NP
	4-28	Sand, loamy sand, fine sand.	SP-SM, SM	A-2, A-3, A-1	0	0	80-100	75-100	30-90	5-25	---	NP
	28-38	Silty clay loam, loam, sandy clay loam.	CL, CL-ML, SC, SC-SM	A-6, A-2, A-4, A-7	0	0	80-100	75-100	45-100	25-85	20-45	4-22
	38-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---	---
Et------------ Ettrick	0-15	Silt loam-----	CL	A-6, A-7	0	0	100	100	90-100	70-90	30-50	10-25
	15-40	Silt loam, silty clay loam.	CL, CH	A-7	0	0	100	100	90-100	85-100	40-55	15-30
	40-60	Stratified silt loam to fine sand.	CL, CL-ML, SC, SC-SM	A-2, A-4, A-6, A-7	0	0	100	100	60-100	30-100	20-45	4-25
FaA----------- Fairchild	0-4	Sand----------	SM, SP-SM	A-2, A-3, A-1	0	0	100	100	20-75	5-35	---	NP
	4-13	Sand, loamy sand.	SP-SM, SM	A-2, A-3, A-1, A-4	0	0	100	100	20-95	5-50	---	NP
	13-21	Sand, loamy sand.	SM, SP-SM	A-2, A-3, A-1, A-4	0	0	100	100	20-95	5-50	---	NP
	21-32	Sand, loamy sand.	SP-SM, SM	A-3, A-2, A-4, A-1	0	0	100	100	20-95	5-50	---	NP
	32-39	Clay loam, loam, sandy clay loam.	CL-ML, CL, SC-SM, SC	A-4, A-6, A-7, A-2	0	0	80-100	75-95	45-90	20-80	20-45	4-21
	39-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---	---

Table 17.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag-ments > 10 inches	Frag-ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct	Pct					Pct	
FeA:												
Fairchild----	0-4	Sand----------	SM, SP-SM	A-2, A-3, A-1	0	0	100	100	20-75	5-35	---	NP
	4-13	Sand, loamy sand.	SP-SM, SM	A-2, A-3, A-1, A-4	0	0	100	100	20-95	5-50	---	NP
	13-21	Sand, loamy sand.	SM, SP-SM	A-2, A-3, A-1, A-4	0	0	100	100	20-95	5-50	---	NP
	21-32	Sand, loamy sand.	SP-SM, SM	A-3, A-2, A-4, A-1	0	0	100	100	20-95	5-50	---	NP
	32-39	Clay loam, loam, sandy clay loam.	CL-ML, CL, SC-SM, SC	A-4, A-6, A-7, A-2	0	0	80-100	75-95	45-90	20-80	20-45	4-21
	39-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---	---
Elm Lake-----	0-4	Muck----------	PT	A-8	0	0	---	---	---	---	---	---
	4-28	Sand, loamy sand, fine sand.	SP-SM, SM	A-2, A-3, A-1	0	0	80-100	75-100	30-90	5-25	---	NP
	28-38	Silty clay loam, loam, sandy clay loam.	CL, CL-ML, SC, SC-SM	A-6, A-2, A-4, A-7	0	0	80-100	75-100	45-100	25-85	20-45	4-22
	38-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---	---
GaC2, GaD2---- Gale	0-8	Silt loam-----	CL-ML, CL	A-4, A-6	0	0	100	100	90-100	85-95	20-30	5-11
	8-27	Silt loam, silty clay loam.	CL	A-6, A-4, A-7	0	0	100	100	90-100	85-95	25-45	9-20
	27-31	Loam, channery sandy loam.	CL	A-4, A-6	0	0	100	100	65-100	50-95	25-40	9-20
	31-39	Sand, loamy sand.	SM, SP-SM, SC-SM	A-3, A-2, A-1, A-4	0	0-2	85-100	85-100	45-75	5-40	<25	NP-7
	39-60	Weathered bedrock, unweathered bedrock.	---	---	---	---	---	---	---	---	---	---
GoB, GoC------ Gosil	0-9	Loamy sand----	SM, SP-SM	A-1, A-2-4	0	0	85-100	75-100	30-75	10-35	---	NP
	9-27	Loamy sand, loamy fine sand, sand.	SM, SP-SM	A-1, A-2-4, A-4	0	0	85-100	75-100	25-95	8-50	<21	NP-4
	27-36	Sand, fine sand.	SM, SP	A-1, A-2-4, A-3	0	0	85-100	75-100	20-85	4-35	---	NP
	36-60	Sand, fine sand.	SM, SP	A-1, A-2-4, A-3	0	0	85-100	75-100	20-85	4-35	---	NP
HkB:												
Hiles--------	0-8	Silt loam-----	CL, CL-ML	A-4	0	0	95-100	95-100	75-100	65-85	20-30	4-10
	8-12	Silt loam-----	CL, CL-ML	A-4	0	0	95-100	95-100	75-100	65-85	20-30	4-10
	12-20	Silt loam-----	CL	A-6	0	0	95-100	95-100	75-100	65-85	25-35	10-15
	20-28	Loam, sandy clay loam, clay loam.	CL, SC	A-6, A-2-6	0	0	90-100	85-95	50-95	25-75	25-40	10-20
	28-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---	---

Table 17.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 10 inches	Frag- ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
HkB:												
Kert	0-3	Silt loam	CL, CL-ML	A-4	0	0	95-100	95-100	70-100	65-85	20-30	4-10
	3-8	Silt loam, silt.	CL, ML, CL-ML	A-4	0	0	95-100	95-100	70-100	65-85	<30	NP-9
	8-19	Silt loam	CL	A-6	0	0	95-100	95-100	70-100	65-85	30-40	10-20
	19-31	Loam, silty clay loam, sandy clay loam.	CL, SC	A-7, A-6, A-2-6	0	0	80-100	75-100	45-100	20-85	30-45	10-20
	31-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---	---
HnB, HnC2, HnD2 Hixton	0-9	Loam	CL, CL-ML	A-4	0	0	100	100	85-95	60-75	20-30	5-10
	9-32	Loam, sandy loam, sandy clay loam.	CL, SC	A-4, A-6, A-2	0	0	70-100	65-100	50-95	25-75	25-35	9-15
	32-39	Sand, fine sand.	SM, SP-SM, SP	A-1, A-3, A-2	0	0	55-100	50-100	35-80	4-30	---	NP
	39-60	Weathered bedrock, unweathered bedrock.	---	---	0	0	---	---	---	---	---	---
HpA Hoop	0-11	Sandy loam	SM, SC-SM	A-4, A-2-4	0	0	80-100	75-100	45-80	20-50	18-25	3-7
	11-24	Sandy loam, fine sandy loam.	SC, SC-SM, CL, CL-ML	A-4, A-2-4	0	0	80-100	75-100	45-90	20-55	21-27	4-9
	24-34	Sand, coarse sand, loamy sand.	SM, SP-SM	A-2-4, A-3, A-1-b	0	0	80-100	75-100	20-75	5-35	<21	NP-4
	34-60	Sand, coarse sand.	SM, SP-SM	A-3, A-1-b	0	0	80-100	75-100	20-70	5-25	---	NP
Ht Houghton	0-60	Muck	PT	A-8	0	0	---	---	---	---	---	---
HuB Humbird	0-3	Fine sandy loam.	SM, SC-SM	A-4, A-2-4	0	0	95-100	95-100	55-90	30-50	15-25	2-7
	3-6	Fine sandy loam, sandy loam.	SM	A-4, A-2-4	0	0	95-100	95-100	55-90	30-50	---	NP
	6-18	Sandy loam, fine sandy loam.	SM, SC, SC-SM	A-4, A-2-4	0	0	80-100	75-100	55-90	30-50	20-28	3-9
	18-30	Clay loam, silty clay, clay.	CL, CH	A-7	0	0	80-100	75-100	60-100	50-95	43-66	21-39
	30-60	Weathered bedrock, unweathered bedrock.	---	---	---	---	---	---	---	---	---	---

Table 17.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 10 inches	Fragments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
HxB:												
Humbird------	0-3	Fine sandy loam.	SM, SC-SM	A-4, A-2-4	0	0	95-100	95-100	55-90	30-50	15-25	2-7
	3-6	Fine sandy loam, sandy loam.	SM	A-4, A-2-4	0	0	95-100	95-100	55-90	30-50	---	NP
	6-18	Sandy loam, fine sandy loam.	SM, SC, SC-SM	A-4, A-2-4	0	0	95-100	95-100	55-90	30-50	20-28	3-9
	18-30	Clay loam, silty clay, clay.	CL, CH	A-7	0	0	80-100	75-100	60-100	50-95	43-66	21-39
	30-60	Weathered bedrock, unweathered bedrock.	---	---	---	---	---	---	---	---	---	---
Merrillan----	0-4	Fine sandy loam.	SM, SC-SM	A-4, A-2-4	0	0	80-100	75-100	45-90	20-50	15-23	2-6
	4-6	Fine sandy loam, sandy loam.	SM, SC-SM	A-4, A-2-4	0	0	80-100	75-100	45-90	20-50	18-25	3-7
	6-15	Sandy loam, fine sandy loam.	SM, SC-SM	A-4, A-2-4	0	0	80-100	75-100	45-90	20-50	18-25	3-7
	15-21	Sandy loam, fine sandy loam.	SC, SC-SM	A-4, A-2-4	0	0	90-100	85-100	45-90	20-50	21-28	4-9
	21-31	Clay loam, silty clay loam, clay.	CL, CH	A-7-6	0	0	90-100	85-100	65-95	50-85	43-65	21-40
	31-60	Weathered bedrock, unweathered bedrock.	---	---	---	---	---	---	---	---	---	---
ImA----------- Impact	0-14	Sand----------	SM, SP-SM	A-2, A-3, A-1	0	0	95-100	75-100	45-80	5-25	---	NP
	14-30	Sand, loamy sand, loamy fine sand.	SM, SP-SM	A-1, A-2, A-3, A-4	0	0	95-100	75-100	45-90	5-40	---	NP
	30-60	Sand, fine sand.	SP, SP-SM	A-1, A-2, A-3	0	0	95-100	75-100	45-80	1-10	---	NP
IrA----------- Ironrun	0-4	Sand----------	SM, SP-SM	A-3, A-1-b	0	0	80-100	75-100	20-70	5-25	---	NP
	4-12	Sand, coarse sand.	SM, SP-SM	A-3, A-1-b	0	0	80-100	75-100	20-70	5-25	---	NP
	12-16	Sand, coarse sand.	SM, SP-SM	A-3, A-1-b	0	0	80-100	75-100	20-75	5-35	---	NP
	16-30	Sand, coarse sand.	SM, SP-SM	A-3, A-1-b	0	0	80-100	75-100	20-75	5-35	---	NP
	30-62	Sand, coarse sand.	SM, SP-SM	A-3, A-1-b	0	0	80-100	75-100	20-70	5-25	---	NP

Table 17.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 10 inches	Frag- ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
IxA:												
Ironrun------	0-4	Sand----------	SM, SP-SM	A-3, A-1-b	0	0	80-100	75-100	20-70	5-25	---	NP
	4-12	Sand, coarse sand.	SM, SP-SM	A-3, A-1-b	0	0	80-100	75-100	20-70	5-25	---	NP
	12-16	Sand, coarse sand.	SM, SP-SM	A-3, A-1-b	0	0	80-100	75-100	20-75	5-35	---	NP
	16-30	Sand, coarse sand.	SM, SP-SM	A-3, A-1-b	0	0	80-100	75-100	20-75	5-35	---	NP
	30-62	Sand, coarse sand.	SM, SP-SM	A-3, A-1-b	0	0	80-100	75-100	20-70	5-25	---	NP
Ponycreek----	0-4	Muck----------	PT	A-8	0	0	---	---	---	---	---	---
	4-6	Mucky sand----	SM, SP-SM	A-1-b, A-3	0	0	80-100	75-100	20-70	5-25	---	NP
	6-29	Sand, coarse sand.	SM, SP-SM	A-1-b, A-3	0	0	80-100	75-100	20-70	5-25	---	NP
	29-64	Sand, coarse sand.	SM, SP-SM	A-1-b, A-3	0	0	80-100	75-100	20-70	5-25	---	NP
IzB:												
Ironrun------	0-4	Sand----------	SM, SP-SM	A-3, A-1-b	0	0	80-100	75-100	20-70	5-25	---	NP
	4-12	Sand, coarse sand.	SM, SP-SM	A-3, A-1-b	0	0	80-100	75-100	20-70	5-25	---	NP
	12-16	Sand, coarse sand.	SM, SP-SM	A-3, A-1-b	0	0	80-100	75-100	20-75	5-35	---	NP
	16-30	Sand, coarse sand.	SM, SP-SM	A-3, A-1-b	0	0	80-100	75-100	20-75	5-35	---	NP
	30-62	Sand, coarse sand.	SM, SP-SM	A-3, A-1-b	0	0	80-100	75-100	20-70	5-25	---	NP
Ponycreek----	0-4	Muck----------	PT	A-8	0	0	---	---	---	---	---	---
	4-6	Mucky sand----	SM, SP-SM	A-1-b, A-3	0	0	80-100	75-100	20-70	5-25	---	NP
	6-29	Sand, coarse sand.	SM, SP-SM	A-1-b, A-3	0	0	80-100	75-100	20-70	5-25	---	NP
	29-64	Sand, coarse sand.	SM, SP-SM	A-1-b, A-3	0	0	80-100	75-100	20-70	5-25	---	NP
Arbutus------	0-3	Loamy sand----	SM	A-2-4, A-1	0	0-5	90-100	85-100	35-75	15-35	0-20	NP-4
	3-6	Loamy sand, sand.	SM, SP	A-2-4, A-1, A-3	0	0-5	90-100	85-100	25-75	4-35	0-20	NP-4
	6-17	Loamy sand, sand.	SM, SP	A-2-4, A-1, A-3	0	0-5	90-100	85-100	25-75	4-35	0-20	NP-5
	17-32	Sand, loamy sand.	SM, SP	A-2-4, A-1, A-3	0	0-5	90-100	85-100	25-75	4-35	0-20	NP-4
	32-36	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	---
JaA, JaB------ Jackson	0-9	Silt loam-----	CL, CL-ML	A-4, A-6	0	0	100	100	90-100	85-95	25-35	5-15
	9-50	Silt loam, silty clay loam.	CL	A-6, A-4	0	0	100	100	90-100	85-100	25-40	7-20
	50-60	Sand, fine sand, loamy sand.	SP-SM, SM	A-2, A-3	0	0	95-100	95-100	50-85	5-35	---	NP

Table 17.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 10 inches	Fragments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct	Pct					Pct	
Ka------------ Kalmarville	0-6	Silt loam-----	ML, CL, CL-ML	A-4	0	0	95-100	90-100	85-100	50-90	15-35	NP-10
	6-42	Fine sandy loam, sandy loam, silt loam.	ML, SM, SC-SM, CL-ML	A-4, A-2	0	0	95-100	90-100	60-85	30-60	15-25	NP-5
	42-60	Coarse sand, sand, fine sand.	SP, SM, SW, SP-SM	A-3, A-2, A-1	---	0-2	90-100	85-100	40-80	2-30	<25	NP
KeA----------- Kert	0-3	Silt loam-----	CL, CL-ML	A-4	0	0	95-100	95-100	70-100	65-85	20-30	4-10
	3-8	Silt loam, silt.	CL, ML, CL-ML	A-4	0	0	95-100	95-100	70-100	65-85	<30	NP-9
	8-19	Silt loam-----	CL	A-6	0	0	95-100	95-100	70-100	65-85	30-40	10-20
	19-31	Loam, silty clay loam, sandy clay loam.	CL, SC	A-7, A-6, A-2-6	0	0	80-100	75-100	45-100	20-85	30-45	10-20
	31-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---	---
LfC2, LfD2---- La Farge	0-6	Silt loam-----	CL, CL-ML	A-4	0	0	100	100	90-100	85-100	20-30	5-10
	6-28	Silt loam, silty clay loam.	CL	A-6, A-7	0	0	100	100	90-100	85-100	25-45	10-25
	28-37	Fine sandy loam, loam, sandy clay loam.	CL, SC	A-6	0	0	80-100	75-100	65-100	45-65	20-35	10-20
	37-60	Unweathered bedrock, weathered bedrock.	---	---	---	---	---	---	---	---	---	---
LsD2:												
La Farge-----	0-6	Silt loam-----	CL, CL-ML	A-4	0	0	100	100	90-100	85-100	20-30	5-10
	6-28	Silt loam, silty clay loam.	CL	A-6, A-7	0	0	100	100	90-100	85-100	25-45	10-25
	28-37	Fine sandy loam, loam, sandy clay loam.	CL, SC	A-6	0	0	80-100	75-100	65-100	45-65	20-35	10-20
	37-60	Unweathered bedrock, weathered bedrock.	---	---	---	---	---	---	---	---	---	---
Seaton-------	0-9	Silt loam-----	CL, CL-ML	A-4, A-6	0	0	100	100	100	95-100	20-35	5-15
	9-46	Silt loam-----	CL, CL-ML	A-6, A-4	0	0	100	100	100	90-100	25-40	5-20
	46-60	Silt loam-----	CL, CL-ML	A-4, A-6	0	0	100	100	100	90-100	25-40	5-20
Lt------------ Loxley	0-4	Peat----------	PT	A-8	0	0	---	---	---	---	---	---
	4-60	Muck, mucky peat.	PT	A-8	0	0	---	---	---	---	---	---

Table 17.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 10 inches	Frag- ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
LuB----------- Ludington	0-4	Sand----------	SM, SP-SM	A-2, A-3, A-1	0	0	80-100	75-100	20-70	5-25	---	NP
	4-6	Sand, loamy sand.	SM, SP-SM	A-2, A-4, A-3, A-1	0	0	80-100	75-100	20-95	5-50	---	NP
	6-20	Sand, loamy sand.	SM, SP-SM	A-2, A-3, A-4, A-1	0	0	80-100	75-100	20-95	5-50	---	NP
	20-28	Sand, loamy sand.	SM, SP-SM	A-2, A-3, A-4, A-1	0	0	80-100	75-100	20-95	5-50	---	NP
	28-39	Loam, sandy clay loam, clay loam.	SC, CL, SC-SM, CL-ML	A-4, A-6, A-7, A-2	0	0	80-100	75-95	45-90	20-80	20-45	4-21
	39-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---	---
LxB: Ludington----	0-3	Sand----------	SM, SP-SM	A-2, A-3, A-1	0	0	80-100	75-100	20-70	5-25	---	NP
	3-13	Sand, loamy sand.	SM, SP-SM	A-2, A-4, A-3, A-1	0	0	80-100	75-100	20-95	5-50	---	NP
	13-20	Sand, loamy sand.	SM, SP-SM	A-2, A-3, A-4, A-1	0	0	80-100	75-100	20-95	5-50	---	NP
	20-27	Sand, loamy sand.	SM, SP-SM	A-2, A-3, A-4, A-1	0	0	80-100	75-100	20-95	5-50	---	NP
	27-39	Loam, sandy clay loam, clay loam.	SC, CL, SC-SM, CL-ML	A-4, A-6, A-7, A-2	0	0	80-100	75-95	45-90	20-80	20-45	4-21
	39-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---	---
Fairchild----	0-4	Sand----------	SM, SP-SM	A-2, A-3, A-1	0	0	100	100	20-75	5-35	---	NP
	4-13	Sand, loamy sand.	SP-SM, SM	A-2, A-3, A-1, A-4	0	0	100	100	20-95	5-50	---	NP
	13-21	Sand, loamy sand.	SM, SP-SM	A-2, A-3, A-1, A-4	0	0	100	100	20-95	5-50	---	NP
	21-32	Sand, loamy sand.	SP-SM, SM	A-3, A-2, A-4, A-1	0	0	100	100	20-95	5-50	---	NP
	32-39	Clay loam, loam, sandy clay loam.	CL-ML, CL, SC-SM, SC	A-4, A-6, A-7, A-2	0	0	80-100	75-95	45-90	20-80	20-45	4-21
	39-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---	---
MaB----------- Mahtomedi	0-4	Loamy sand----	SM, SC-SM	A-2, A-1	0	0-2	95-100	75-100	40-85	15-30	15-20	NP-4
	4-20	Sand, coarse sand, loamy sand.	SM, SP-SM	A-1, A-2, A-3	0	0-2	80-100	70-100	30-75	5-15	15-20	NP
	20-26	Gravelly coarse sand, gravelly sand.	SP-SM, SM	A-2, A-3, A-1	0	0-10	70-95	50-85	30-75	5-15	15-20	NP
	26-60	Gravelly coarse sand, gravelly sand.	SP, SM, SP-SM	A-2, A-3, A-1	0	0-10	40-95	35-85	30-70	2-15	15-20	NP

Table 17.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 10 inches	Frag- ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
MbA----------- Majik	0-4	Loamy fine sand.	SM, SP-SM	A-2-4, A-4	0	0	80-100	75-100	55-95	20-50	<21	NP-4
	4-7	Sand, fine sand, loamy fine sand.	SM, SP	A-1, A-3, A-2, A-4	0	0	80-100	75-100	20-95	4-50	<21	NP-4
	7-29	Loamy fine sand, fine sand, sand.	SM, SP	A-1, A-3	0	0	80-100	75-100	20-95	4-50	---	NP
	29-60	Fine sand, sand.	SM, SP	A-1, A-3	0	0	80-100	75-100	20-85	4-35	---	NP
MmA----------- Merimod	0-9	Silt loam-----	CL-ML, CL	A-4, A-6	0	0	80-100	75-100	60-100	50-85	23-30	6-11
	9-17	Silt loam-----	CL	A-4, A-6	0	0	80-100	75-100	60-100	50-85	28-34	9-14
	17-32	Loam, sandy loam, sandy clay loam.	CL, SC	A-4, A-6, A-2-4, A-2-6	0	0	80-100	75-100	45-95	20-80	28-34	9-14
	32-60	Sand, fine sand.	SM, SP-SM	A-3, A-1-b	0	0	80-100	75-100	20-85	5-35	---	NP
MnB----------- Merit	0-9	Silt loam-----	CL-ML, CL	A-4, A-6	0	0	80-100	75-100	60-100	50-85	23-30	6-11
	9-12	Silt loam-----	CL	A-4, A-6	0	0	80-100	75-100	60-100	50-85	28-34	9-14
	12-30	Loam, sandy loam, sandy clay loam.	CL, SC	A-4, A-6, A-2-4, A-2-6	0	0	80-100	75-100	45-95	20-80	28-34	9-14
	30-60	Sand, fine sand.	SM, SP-SM	A-3, A-1-b	0	0	80-100	75-100	20-85	5-35	---	NP
MoB: Merit---------	0-9	Silt loam-----	CL-ML, CL	A-4, A-6	0	0	80-100	75-100	60-100	50-85	23-30	6-11
	9-12	Silt loam-----	CL	A-4, A-6	0	0	80-100	75-100	60-100	50-85	28-34	9-14
	12-30	Loam, sandy loam, sandy clay loam.	CL, SC	A-4, A-6, A-2-4, A-2-6	0	0	80-100	75-100	45-95	20-80	28-34	9-14
	30-60	Sand, fine sand.	SM, SP-SM	A-3, A-1-b	0	0	80-100	75-100	20-85	5-35	---	NP
Gardenvale---	0-8	Silt loam-----	CL	A-4	0	0	80-100	75-100	60-100	50-85	25-30	7-11
	8-26	Silt loam-----	CL	A-6	0	0	80-100	75-100	60-100	50-85	28-37	9-16
	26-30	Sandy loam, loam, sandy clay loam.	CL, SC	A-4, A-6	0	0	80-100	75-100	45-95	25-70	25-37	7-16
	30-50	Fine sand, sand.	SM, SP-SM	A-3, A-1-b, A-2-4	0	0	80-100	75-100	20-85	5-35	<21	NP-4
	50-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---	---

Table 17.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 10 inches	Frag- ments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
MpA----------- Merrillan	0-5	Fine sandy loam.	SM, SC-SM	A-4, A-2-4	0	0	80-100	75-100	45-90	20-50	15-23	2-6
	5-10	Fine sandy loam, sandy loam.	SM, SC-SM	A-4, A-2-4	0	0	80-100	75-100	45-90	20-50	18-25	3-7
	10-18	Sandy loam, fine sandy loam.	SM, SC-SM	A-4, A-2-4	0	0	80-100	75-100	45-90	20-50	18-25	3-7
	18-24	Sandy loam, fine sandy loam.	SC, SC-SM	A-4, A-2-4	0	0	80-100	75-100	45-90	20-50	21-28	4-9
	24-34	Clay loam, silty clay loam, clay.	CL, CH	A-7-6	0	0	80-100	75-100	65-95	50-85	43-65	21-40
	34-60	Weathered bedrock, unweathered bedrock.	---	---	---	---	---	---	---	---	---	---
MrA: Merrillan----	0-4	Fine sandy loam.	SM, SC-SM	A-4, A-2-4	0	0	80-100	75-100	45-90	20-50	15-23	2-6
	4-6	Fine sandy loam, sandy loam.	SM, SC-SM	A-4, A-2-4	0	0	80-100	75-100	45-90	20-50	18-25	3-7
	6-15	Sandy loam, fine sandy loam.	SM, SC-SM	A-4, A-2-4	0	0	80-100	75-100	45-90	20-50	18-25	3-7
	15-21	Sandy loam, fine sandy loam.	SC, SC-SM	A-4, A-2-4	0	0	80-100	75-100	45-90	20-50	21-28	4-9
	21-31	Clay loam, silty clay loam, clay.	CL, CH	A-7-6	0	0	80-100	75-100	65-95	50-85	43-65	21-40
	31-60	Weathered bedrock, unweathered bedrock.	---	---	---	---	---	---	---	---	---	---
Veedum-------	0-3	Muck----------	PT	A-8	0	0	---	---	---	---	---	---
	3-9	Silt loam-----	ML, ML, SM, SC	A-4, A-1	0	0	95-100	95-100	70-100	65-85	15-30	NP-9
	9-17	Silt loam-----	SC, CL	A-6, A-4	0	0	95-100	95-100	70-100	65-85	30-40	10-20
	17-33	Clay loam, silty clay loam, sandy loam.	CL, SC	A-7, A-6, A-2-6	0	0	80-100	75-100	45-100	20-85	30-45	10-20
	33-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---	---
MxA: Moppet-------	0-4	Fine sandy loam.	SC, SC-SM, CL, CL-ML	A-4, A-2-4	0	0	100	100	60-95	30-65	21-26	4-8
	4-32	Fine sandy loam, loam, loamy sand.	ML, SM, SC, CL	A-4	0	0	100	100	75-100	40-85	18-28	3-9
	32-60	Sand, fine sand, loamy fine sand.	SM, SP-SM, SP	A-1-b, A-2-4, A-4	0	0-5	80-100	75-100	35-95	2-50	15-21	NP-4

Table 17.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 10 inches	Frag- ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
MxA:												
Fordum-------	0-6	Silt loam-----	ML, CL, SM, SC	A-4, A-6	0	0-15	80-100	75-100	55-100	45-85	20-35	3-15
	6-35	Silt loam, sandy loam, gravelly loam.	SM, SC, ML, CL	A-2, A-4, A-1	0	0-15	60-100	55-100	30-100	10-90	<30	3-10
	35-60	Sand, gravelly loamy fine sand.	SP, SM, GP, SM	A-3, A-2, A-1	0	0-15	60-100	55-100	12-95	1-50	---	NP
Ne------------ Newlang	0-3	Muck----------	PT	A-8	0	0	---	---	---	---	---	---
	3-6	Mucky sand, loamy sand.	SM, SP	A-1, A-3, A-2-4	0	0	80-100	75-100	20-75	4-35	---	NP
	6-22	Sand, loamy sand.	SM, SP	A-1, A-3, A-2-4	0	0	80-100	75-100	20-75	4-35	---	NP
	22-63	Sand, loamy sand.	SM, SP	A-1, A-3, A-2-4	0	0	80-100	75-100	20-75	4-35	---	NP
OrA----------- Orion	0-8	Silt loam-----	CL, CL-ML	A-4, A-6	0	0	100	100	85-100	80-100	25-35	4-12
	8-32	Stratified silt loam to very fine sand.	CL, CL-ML	A-4	0	0	100	100	90-100	70-80	20-30	4-10
	32-40	Silt loam, silty clay loam.	CL, CL-ML	A-6, A-4	0	0	100	100	85-100	85-100	20-40	4-18
	40-60	Stratified silt loam to very fine sand.	CL, CL-ML	A-4	0	0	80-100	80-100	80-100	80-100	20-30	4-10
Pa------------ Palms	0-40	Muck----------	PT	A-8	0	0	---	---	---	---	---	NP
	40-60	Silt loam, sandy loam, loam.	CL-ML, CL	A-4, A-6	0	0	85-100	80-100	70-95	50-90	25-40	5-20
Pt. Pits												
Pu------------ Ponycreek	0-4	Muck----------	PT	A-8	0	0	---	---	---	---	---	---
	4-6	Mucky sand----	SM, SP-SM	A-1-b, A-3	0	0	80-100	75-100	20-70	5-25	---	NP
	6-29	Sand, coarse sand.	SM, SP-SM	A-1-b, A-3	0	0	80-100	75-100	20-70	5-25	---	NP
	29-64	Sand, coarse sand.	SM, SP-SM	A-1-b, A-3	0	0	80-100	75-100	20-70	5-25	---	NP
Pv:												
Ponycreek----	0-6	Muck----------	PT	A-8	0	0	---	---	---	---	---	---
	6-8	Mucky sand----	SM, SP-SM	A-1-b, A-3	0	0	80-100	75-100	20-70	5-25	---	NP
	8-21	Sand, coarse sand.	SM, SP-SM	A-1-b, A-3	0	0	80-100	75-100	20-70	5-25	---	NP
	21-66	Sand, coarse sand.	SM, SP-SM	A-1-b, A-3	0	0	80-100	75-100	20-70	5-25	---	NP
Dawsil-------	0-20	Mucky peat----	PT	A-8	0	0	---	---	---	---	---	---
	20-40	Muck----------	PT	A-8	0	0	---	---	---	---	---	---
	40-60	Sand, coarse sand, loamy sand.	SC-SM, SM, SC, SP-SM	A-2, A-3, A-1, A-4	0	0	45-100	35-100	15-90	0-45	<20	NP-10

Table 17.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 10 inches	Frag- ments 3-10 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
Pw------------ Psammaquents	0-6	Sand, loamy sand.	SM, SP-SM	A-3, A-1-b	0	0-3	90-100	85-100	20-75	1-35	---	NP
	6-60	Sand, loamy sand.	SM, SP-SM	A-3, A-1-b	0	0-3	90-100	85-100	20-75	1-35	---	NP
RkA----------- Rockdam	0-3	Sand----------	SM, SP-SM	A-3, A-1-b	0	0	80-100	75-100	20-70	5-25	---	NP
	3-6	Sand, coarse sand.	SM, SP-SM	A-3, A-1-b	0	0	80-100	75-100	20-70	5-25	---	NP
	6-19	Sand, coarse sand.	SM, SP-SM	A-3, A-1-b	0	0	80-100	75-100	20-70	5-25	---	NP
	19-27	Sand, coarse sand.	SM, SP-SM	A-3, A-1-b	0	0	80-100	75-100	20-70	5-25	---	NP
	27-61	Sand, coarse sand.	SM, SP-SM	A-3, A-1-b	0	0	80-100	75-100	20-70	5-25	---	NP
RoA----------- Rowley	0-11	Silt loam-----	CL	A-4, A-6	0	0	100	100	90-100	85-95	25-35	8-13
	11-38	Silt loam-----	CL	A-6, A-7	0	0	100	100	90-100	85-95	30-50	10-25
	38-50	Stratified silt loam to sand.	CL, CL-ML, SC, SC-SM	A-4, A-6	0	0	100	100	80-100	35-75	20-30	4-11
	50-60	Sand, fine sand.	SM, SP-SM	A-2, A-3	0	0	100	100	50-90	5-35	---	NP
SeB----------- Seaton	0-9	Silt loam-----	CL, CL-ML, ML	A-4, A-6, A-7	0	0	100	100	100	95-100	20-45	5-20
	9-46	Silt loam-----	CL, CL-ML	A-6, A-4, A-7	0	0	100	100	100	90-100	25-45	5-25
	46-60	Silt loam, silt.	CL, CL-ML	A-4, A-6	0	0	100	100	100	90-100	25-40	5-20
SeC2---------- Seaton	0-9	Silt loam-----	CL, CL-ML	A-4, A-6	0	0	100	100	100	95-100	20-35	5-15
	9-46	Silt loam-----	CL, CL-ML	A-6, A-4, A-7	0	0	100	100	100	90-100	25-45	5-25
	46-60	Silt loam-----	CL, CL-ML	A-4, A-6	0	0	100	100	100	90-100	25-40	5-20
SmB----------- Sebbo	0-9	Loam----------	SC, CL	A-4, A-6	0	0	80-100	75-100	60-90	40-80	25-32	7-13
	9-44	Loam, silt loam.	SC, CL	A-6	0	0	80-100	75-100	60-95	40-85	28-35	9-15
	44-60	Silt loam, loam.	SC, CL	A-4, A-6	0	0	80-100	75-100	60-95	40-85	25-32	7-13
SnA----------- Sechler	0-9	Loam----------	CL, CL-ML, ML	A-4	0	0-9	80-100	75-100	60-100	50-85	18-28	3-9
	9-12	Loam, gravelly silt loam.	SM, SC, CL, ML	A-4	0	0-9	65-100	60-100	45-100	35-85	18-28	3-9
	12-16	Very gravelly loam, very gravelly silt loam.	SM, SC, CL, ML	A-4, A-2-4, A-1-b	0	0-9	30-95	25-70	20-70	15-65	18-28	3-9
	16-22	Very gravelly fine sandy loam, very gravelly sandy loam.	SM, SP-SM, SC-SM	A-4, A-1-a, A-2-4	0	0-9	30-95	25-70	15-65	9-40	15-25	NP-7
	22-27	Loamy fine sand, loamy sand.	SM, SP-SM	A-1-b	0	0	80-100	75-100	30-95	10-50	---	NP
	27-60	Fine sand, sand.	SM, SP-SM	A-1-b, A-3	0	0	80-100	75-100	20-85	5-35	---	NP

Table 17.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 10 inches	Frag- ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
SoA-----------	0-9	Silt loam-----	CL-ML, CL	A-4, A-6	0	0	80-100	75-100	60-100	50-85	23-30	6-11
Sooner	9-15	Silt loam-----	CL	A-4, A-6	0	0	80-100	75-100	60-100	50-85	28-34	9-14
	15-27	Loam, sandy clay loam.	SC, CL	A-4, A-6	0	0	80-100	75-100	50-95	40-80	28-34	9-14
	27-31	Sandy loam, loam, sandy clay loam.	SC, CL	A-4, A-6	0	0	80-100	75-100	50-95	40-75	28-34	9-14
	31-60	Sand, coarse sand.	SM, SP-SM	A-3, A-1-b	0	0	80-100	75-100	20-85	5-35	---	NP
SpA-----------	0-16	Sand----------	SP-SM, SM	A-3, A-2	0	0	85-100	85-100	50-75	5-35	---	NP
Sparta	16-42	Fine sand, sand.	SP-SM, SM	A-2, A-3	0	0	85-100	85-100	50-95	2-35	---	NP
	42-60	Sand, fine sand.	SP-SM, SM, SP	A-2, A-3	0	0	85-100	85-100	50-95	2-30	---	NP
TrB, TrC------	0-8	Sand----------	SM, SP-SM	A-1, A-2, A-3	0	0	95-100	90-100	20-70	5-25	---	NP
Tarr	8-36	Sand, fine sand.	SP, SP-SM	A-1, A-3, A-2	0	0	95-100	90-100	45-80	1-10	---	NP
	36-60	Sand, fine sand.	SP, SP-SM	A-1, A-3, A-2	0	0	95-100	90-100	45-80	1-10	---	NP
TrF-----------	0-2	Sand----------	SM, SP-SM	A-1, A-2, A-3	0	0	95-100	90-100	20-70	5-25	---	NP
Tarr	2-30	Sand, fine sand.	SP, SP-SM	A-1, A-3, A-2	0	0	95-100	90-100	45-80	1-10	---	NP
	30-60	Sand, fine sand.	SP, SP-SM	A-1, A-3, A-2	0	0	95-100	90-100	45-80	1-10	---	NP
TtA-----------	0-9	Sand----------	SM, SP	A-1, A-3, A-2-4	0	0	80-100	75-100	20-70	4-25	---	NP
Tint	9-29	Sand, fine sand.	SM, SP	A-1, A-3, A-2-4	0	0	80-100	75-100	20-85	4-35	---	NP
	29-60	Sand, fine sand.	SM, SP	A-1, A-3, A-2-4	0	0	80-100	75-100	20-85	4-35	---	NP
TuB-----------	0-8	Sand----------	SM, SP	A-2, A-1, A-3	0	0	95-100	90-100	25-70	4-25	<21	NP-4
Tintson	8-46	Sand, fine sand.	SM, SP	A-1, A-2, A-3	0	0	95-100	90-100	20-85	4-35	---	NP
	46-60	Loam, silt loam, sandy loam.	ML, CL, SM, SC	A-4, A-2	0	0	95-100	90-100	55-100	30-90	<30	3-10
TwA-----------	0-17	Silt loam-----	CL	A-4, A-6	0	0	100	100	90-100	85-95	25-35	8-13
Toddville	17-42	Silt loam, silty clay loam.	CL	A-6, A-7	0	0	100	100	90-100	80-95	35-50	15-25
	42-55	Stratified silt loam to sand.	CL-ML, CL, SC-SM, SC	A-4, A-6	0	0	100	100	85-100	35-75	20-30	4-11
	55-60	Sand, fine sand.	SM, SP-SM	A-2, A-3	0	0	100	100	50-90	5-35	---	NP
UdF-----------	0-60	Silt loam, loam, sandy loam.	ML, CL, SM, SC	A-4, A-6, A-2	0	0-5	80-100	75-100	45-90	20-80	<40	NP-18

Table 17.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag-ments > 10 inches	Frag-ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct	Pct					Pct	
UfC2, UfD2----Urne	0-2	Fine sandy loam.	SM, ML, CL-ML, SC-SM	A-4	0	0	90-100	90-100	65-95	35-65	<26	2-7
	2-36	Very fine sandy loam, loam, sandy loam.	SM, ML, CL, SC	A-2, A-4, A-1	0	0	70-100	65-100	40-95	20-65	20-30	3-9
	36-60	Weathered bedrock, unweathered bedrock.	---	---	---	---	---	---	---	---	---	---
UrF:												
Urne----------	0-2	Fine sandy loam.	SM, ML, CL-ML, SC-SM	A-4	0	0	90-100	90-100	65-95	35-65	<26	2-7
	2-36	Very fine sandy loam, loam, sandy loam.	SM, ML, CL, SC	A-2, A-4, A-1	0	0	70-100	65-100	40-95	20-65	20-30	3-9
	36-60	Weathered bedrock, unweathered bedrock.	---	---	---	---	---	---	---	---	---	---
Council------	0-7	Loam----------	ML, SM	A-4	0	0	80-100	75-100	55-100	45-85	<20	NP-4
	7-45	Loam, silt loam, sandy loam.	CL, CL-ML, SC, SC-SM	A-4	0	0	80-100	75-100	50-100	35-85	20-28	4-9
	45-60	Sandy loam, loam, silt loam.	ML, CL, SM, SC	A-4, A-2	0	0	80-100	75-100	50-100	30-85	<28	NP-9
Vs:												
Veedum-------	0-7	Muck----------	PT	A-8	0	0	---	---	---	---	---	---
	7-11	Silt loam-----	ML, ML, SM, SC	A-4, A-1	0	0	95-100	95-100	70-100	65-85	15-30	NP-9
	11-21	Silt loam-----	SC, CL	A-6, A-4	0	0	95-100	95-100	70-100	65-85	30-40	10-20
	21-31	Clay loam, silty clay loam, sandy loam.	CL, SC	A-7, A-6, A-2-6	0	0	80-100	75-100	45-100	20-85	30-45	10-20
	31-67	Weathered bedrock.	---	---	---	---	---	---	---	---	---	---
Elm Lake-----	0-6	Muck----------	PT	A-8	0	0	---	---	---	---	---	---
	6-28	Sand, loamy sand, fine sand.	SP-SM, SM	A-2, A-3, A-1	0	0	80-100	75-100	30-75	5-35	---	NP
	28-38	Silty clay loam, loam, sandy clay loam.	CL, CL-ML, SC, SC-SM	A-6, A-2, A-4	0	0	80-100	75-95	45-95	25-85	20-45	4-22
	38-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---	---

Table 17.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 10 inches	Frag- ments 3-10 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct	Pct					Pct	
WmA----------- Whitehall	0-12	Silt loam-----	CL, CL-ML, ML	A-4	0	0	100	100	90-100	85-100	20-29	3-10
	12-28	Silt loam, silty clay loam.	CL, ML	A-6	0	0	100	100	90-100	80-100	25-40	10-20
	28-32	Loam, sandy loam.	CL, CL-ML, SC, SC-SM	A-4, A-6	0	0	100	100	60-95	35-80	20-29	5-12
	32-60	Loamy sand, sand.	SM, SP-SM	A-3, A-2	0	0	100	100	50-75	5-30	---	NP

Table 18.--Physical and Chemical Properties of the Soils

(The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated)

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
AbA---------------- Absco	0-4	4-15	1.30-1.60	6.0-20	0.10-0.12	4.5-7.3	Low-----------	0.10	5	2	.5-2
	4-14	0-10	1.45-1.65	6.0-20	0.05-0.11	4.5-7.3	Low-----------	0.17			
	14-42	2-10	1.45-1.65	6.0-20	0.05-0.09	4.5-7.3	Low-----------	0.15			
	42-60	0-10	1.55-1.70	6.0-20	0.04-0.06	4.5-7.3	Low-----------	0.15			
AcA:											
Absco-------------	0-4	4-15	1.30-1.60	6.0-20	0.10-0.12	4.5-7.3	Low-----------	0.10	5	2	.5-2
	4-14	0-10	1.45-1.65	6.0-20	0.05-0.11	4.5-7.3	Low-----------	0.17			
	14-42	2-10	1.45-1.65	6.0-20	0.05-0.09	4.5-7.3	Low-----------	0.15			
	42-60	0-10	1.55-1.70	6.0-20	0.04-0.06	4.5-7.3	Low-----------	0.15			
Northbend---------	0-7	10-14	1.35-1.45	0.6-2.0	0.20-0.24	3.5-6.5	Low-----------	0.37	4	5	2-4
	7-34	5-17	1.35-1.85	0.6-2.0	0.12-0.22	3.5-6.5	Low-----------	0.43			
	34-36	4-8	1.45-1.70	2.0-6.0	0.08-0.13	4.5-7.3	Low-----------	0.17			
	36-60	2-5	1.55-1.70	6.0-20	0.04-0.10	4.5-7.3	Low-----------	0.15			
Ad---------------- Adder	0-22	---	0.30-0.55	0.2-6.0	0.35-0.45	5.1-7.3	--------------	----	2	2	55-75
	22-60	2-8	1.55-1.75	6.0-60	0.03-0.08	5.6-7.3	Low-----------	0.15			
ArA---------------- Arenzville	0-32	10-18	1.20-1.55	0.6-2.0	0.20-0.24	5.6-7.8	Low-----------	0.37	5	5	1-3
	32-42	10-27	1.25-1.45	0.6-2.0	0.18-0.22	5.6-7.8	Moderate------	0.37			
	42-60	10-20	1.20-1.40	0.6-2.0	0.20-0.22	5.6-7.8	Low-----------	0.37			
BeB---------------- Bertrand	0-9	15-22	1.35-1.60	0.6-2.0	0.22-0.24	5.6-7.3	Low-----------	0.37	4	5	1-3
	9-43	18-30	1.55-1.65	0.6-2.0	0.18-0.22	5.1-6.5	Moderate------	0.37			
	43-48	10-20	1.55-1.65	0.6-6.0	0.09-0.22	5.1-6.5	Low-----------	0.37			
	48-60	1-4	1.55-1.65	6.0-20	0.05-0.09	5.1-6.5	Low-----------	0.15			
BkA---------------- Bilmod	0-9	5-15	1.45-1.65	0.6-2.0	0.14-0.16	4.5-7.3	Low-----------	0.17	4	3	1-2
	9-24	6-18	1.40-1.70	0.6-2.0	0.10-0.17	4.5-6.5	Low-----------	0.20			
	24-32	3-10	1.50-1.70	2.0-6.0	0.05-0.10	4.5-6.5	Low-----------	0.17			
	32-60	1-5	1.60-1.70	6.0-20	0.03-0.08	4.5-6.5	Low-----------	0.15			
BlB---------------- Bilson	0-8	5-15	1.45-1.65	0.6-2.0	0.14-0.16	5.1-7.3	Low-----------	0.17	4	3	1-2
	8-32	6-18	1.40-1.70	0.6-6.0	0.10-0.17	5.1-6.5	Low-----------	0.20			
	32-60	1-8	1.60-1.70	6.0-20	0.03-0.08	4.5-6.5	Low-----------	0.15			
BnB:											
Bilson------------	0-8	5-15	1.45-1.65	0.6-2.0	0.14-0.16	5.1-7.3	Low-----------	0.17	4	3	1-2
	8-32	6-18	1.40-1.70	0.6-6.0	0.10-0.17	5.1-6.5	Low-----------	0.20			
	32-60	1-8	1.60-1.70	6.0-20	0.03-0.08	4.5-6.5	Low-----------	0.15			
Silverhill--------	0-8	5-15	1.35-1.70	0.6-6.0	0.13-0.15	5.1-7.3	Low-----------	0.24	4	3	1-2
	8-26	10-17	1.40-1.70	0.6-6.0	0.12-0.19	5.1-6.5	Low-----------	0.24			
	26-32	5-10	1.45-1.70	6.0-20	0.06-0.11	5.1-6.5	Low-----------	0.17			
	32-50	1-10	1.50-1.70	6.0-20	0.05-0.10	4.5-6.5	Low-----------	0.15			
	50-60	---	---	0.2-2.0	---	---	--------------	----			
BnC2, BnD2:											
Bilson------------	0-8	5-15	1.45-1.65	0.6-2.0	0.14-0.16	5.1-7.3	Low-----------	0.20	4	3	1-2
	8-32	6-18	1.40-1.70	0.6-6.0	0.10-0.17	5.1-6.5	Low-----------	0.20			
	32-60	1-8	1.60-1.70	6.0-20	0.03-0.08	4.5-6.5	Low-----------	0.15			

Table 18.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
BnC2, BnD2:											
Elevasil--------	0-3	8-13	1.40-1.60	0.6-6.0	0.10-0.16	3.5-7.3	Low-----------	0.28	3	3	1-2
	3-27	10-17	1.45-1.60	0.6-6.0	0.06-0.14	4.5-6.0	Low-----------	0.24			
	27-31	2-10	1.50-1.70	6.0-20	0.03-0.10	4.5-6.5	Low-----------	0.17			
	31-39	1-8	1.50-1.70	6.0-20	0.02-0.08	4.5-6.5	Low-----------	0.15			
	39-60	---	---	0.2-2.0	---	---	-------------	----			
BoB, BoC, BoF---- Boone	0-3	2-3	1.55-1.65	6.0-20	0.07-0.10	3.5-7.3	Low-----------	0.02	3	1	<1
	3-8	1-5	1.55-1.70	6.0-20	0.03-0.12	3.5-7.3	Low-----------	0.15			
	8-35	0-3	1.55-1.70	6.0-20	0.02-0.11	4.5-6.5	Low-----------	0.15			
	35-61	---	---	0.2-2.0	---	---	-------------	----			
BpF:											
Boone-----------	0-3	2-3	1.55-1.65	6.0-20	0.07-0.10	3.5-7.3	Low-----------	0.02	3	1	<1
	3-8	1-5	1.55-1.70	6.0-20	0.03-0.12	3.5-7.3	Low-----------	0.15			
	8-35	0-3	1.55-1.70	6.0-20	0.02-0.11	4.5-6.5	Low-----------	0.15			
	35-61	---	---	0.2-2.0	---	---	-------------	----			
Elevasil--------	0-3	8-13	1.40-1.60	0.6-6.0	0.10-0.16	3.5-7.3	Low-----------	0.24	3	3	1-2
	3-27	10-17	1.45-1.60	0.6-6.0	0.06-0.14	4.5-6.0	Low-----------	0.24			
	27-31	2-10	1.50-1.70	6.0-20	0.03-0.10	4.5-6.5	Low-----------	0.17			
	31-39	1-8	1.50-1.70	6.0-20	0.02-0.08	4.5-6.5	Low-----------	0.15			
	39-60	---	---	0.2-2.0	---	---	-------------	----			
Cd--------------- Citypoint	0-12	---	0.20-0.35	0.2-6.0	0.55-0.65	3.6-5.0	-------------	----	2	5	65-85
	12-26	---	0.15-0.40	0.2-6.0	0.35-0.45	3.6-5.0	-------------	0.10			
	26-34	0-50	1.55-1.75	0.06-20	0.05-0.18	3.6-5.0	Low-----------	0.15			
	34-60	---	---	0.00-0.6	---	---	-------------	----			
CfA-------------- Coffton	0-11	15-22	1.35-1.55	0.6-2.0	0.22-0.25	5.6-7.3	Low-----------	0.32	5	5	2-4
	11-38	10-17	1.40-1.60	0.6-2.0	0.20-0.22	5.6-7.3	Low-----------	0.43			
	38-60	5-15	1.50-1.70	0.6-2.0	0.11-0.19	5.6-7.3	Low-----------	0.43			
CoC2------------- Council	0-7	6-10	1.35-1.60	0.6-2.0	0.17-0.24	4.5-7.3	Low-----------	0.32	5	5	1-2
	7-45	10-17	1.55-1.65	0.6-2.0	0.14-0.22	4.5-6.5	Low-----------	0.32			
	45-60	6-17	1.55-1.65	0.6-2.0	0.12-0.20	5.1-7.3	Low-----------	0.24			
CpC2, CpD2:											
Council---------	0-9	6-10	1.35-1.60	0.6-2.0	0.11-0.18	4.5-7.3	Low-----------	0.32	5	3	1-2
	9-41	10-17	1.55-1.65	0.6-2.0	0.14-0.22	4.5-6.5	Low-----------	0.32			
	41-60	6-17	1.55-1.65	0.6-2.0	0.12-0.20	5.1-7.3	Low-----------	0.24			
Bilson----------	0-8	5-15	1.45-1.65	0.6-2.0	0.14-0.16	5.1-7.3	Low-----------	0.28	4	3	1-2
	8-27	6-18	1.40-1.70	0.6-6.0	0.10-0.17	5.1-6.5	Low-----------	0.20			
	27-60	1-8	1.60-1.70	6.0-20	0.03-0.08	4.5-6.5	Low-----------	0.15			
CsD2:											
Council---------	0-7	6-10	1.35-1.60	0.6-2.0	0.17-0.24	4.5-7.3	Low-----------	0.32	5	5	1-2
	7-45	10-17	1.55-1.65	0.6-2.0	0.14-0.22	4.5-6.5	Low-----------	0.32			
	45-60	6-17	1.55-1.65	0.6-2.0	0.12-0.20	5.1-7.3	Low-----------	0.24			
Seaton----------	0-9	15-22	1.10-1.20	0.6-2.0	0.22-0.24	5.6-7.3	Low-----------	0.49	5	5	1-3
	9-46	18-27	1.15-1.30	0.6-2.0	0.20-0.22	4.5-7.3	Low-----------	0.37			
	46-60	15-25	1.20-1.40	0.6-2.0	0.20-0.22	5.6-8.4	Low-----------	0.37			
CsE:											
Council---------	0-7	6-10	1.35-1.60	0.6-2.0	0.17-0.24	4.5-7.3	Low-----------	0.32	5	5	1-2
	7-45	10-17	1.55-1.65	0.6-2.0	0.14-0.22	4.5-6.5	Low-----------	0.32			
	45-60	6-17	1.55-1.65	0.6-2.0	0.12-0.20	5.1-7.3	Low-----------	0.24			

Table 18.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
CsE:											
Seaton----------	0-9	10-22	1.10-1.45	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.43	5	5	1-3
	9-38	18-27	1.20-1.60	0.6-2.0	0.20-0.22	4.5-7.3	Low----------	0.37			
	38-60	10-25	1.20-1.50	0.6-2.0	0.20-0.22	5.6-8.4	Low----------	0.37			
Da--------------- Dawsil	0-20	---	0.20-0.35	0.6-6.0	0.45-0.55	3.6-4.4	-------------	----	2	5	65-85
	20-40	---	0.15-0.40	0.2-6.0	0.35-0.45	3.6-4.4	-------------	0.10			
	40-60	0-10	1.55-1.70	6.0-20	0.03-0.10	3.6-6.5	Low----------	0.15			
DuA-------------- Dunnville	0-16	5-10	1.35-1.70	0.6-6.0	0.12-0.22	5.1-6.5	Low----------	0.20	4	3	1-3
	16-24	10-18	1.40-1.65	0.6-6.0	0.11-0.19	5.1-6.5	Low----------	0.28			
	24-27	5-10	1.55-1.70	0.6-6.0	0.09-0.17	5.1-6.5	Low----------	0.28			
	27-60	1-5	1.55-1.70	>6.0	0.03-0.07	5.1-6.5	Low----------	0.15			
ElB-------------- Elevasil	0-3	8-13	1.40-1.60	0.6-6.0	0.10-0.16	3.5-7.3	Low----------	0.24	4	3	1-2
	3-27	10-17	1.45-1.60	0.6-6.0	0.06-0.14	4.5-6.0	Low----------	0.24			
	27-31	2-10	1.50-1.70	6.0-20	0.03-0.10	4.5-6.5	Low----------	0.17			
	31-39	1-8	1.50-1.70	6.0-20	0.02-0.08	4.5-6.5	Low----------	0.15			
	39-60	---	---	0.2-2.0	---	---	-------------	----			
ElC2, ElD2------- Elevasil	0-3	8-13	1.40-1.60	0.6-6.0	0.10-0.16	3.5-7.3	Low----------	0.28	3	3	1-2
	3-27	10-17	1.45-1.60	0.6-6.0	0.06-0.14	4.5-6.0	Low----------	0.24			
	27-31	2-10	1.50-1.70	6.0-20	0.03-0.10	4.5-6.5	Low----------	0.17			
	31-39	1-8	1.50-1.70	6.0-20	0.02-0.08	4.5-6.5	Low----------	0.15			
	39-60	---	---	0.2-2.0	---	---	-------------	----			
Eo--------------- Elm Lake	0-4	3-8	1.20-1.40	2.0-6.0	0.16-0.20	3.6-6.0	Low----------	0.02	3	2	10-20
	4-28	2-8	1.45-1.65	6.0-20	0.06-0.10	3.6-6.0	Low----------	0.15			
	28-38	10-35	1.45-1.70	0.2-2.0	0.10-0.19	3.6-5.5	Moderate-----	0.43			
	38-60	---	---	0.00-0.6	---	---	-------------	----			
Et--------------- Ettrick	0-15	15-27	1.25-1.35	0.6-2.0	0.22-0.29	6.1-7.8	Low----------	0.32	5	6	4-12
	15-40	20-35	1.30-1.45	0.2-0.6	0.18-0.29	6.1-8.4	Moderate-----	0.28			
	40-60	8-27	1.30-1.50	0.2-2.0	0.20-0.25	6.1-8.4	Low----------	0.28			
FaA-------------- Fairchild	0-4	2-8	1.25-1.45	2.0-20	0.06-0.12	3.5-7.3	Low----------	0.02	3	1	2-5
	4-13	1-6	1.35-1.65	6.0-20	0.06-0.10	3.5-6.0	Low----------	0.15			
	13-21	2-8	1.45-1.65	6.0-20	0.06-0.10	3.5-6.0	Low----------	0.15			
	21-32	2-8	1.50-1.65	6.0-20	0.06-0.10	3.5-6.0	Low----------	0.15			
	32-39	10-35	1.45-1.70	0.2-2.0	0.10-0.19	3.5-5.5	Moderate-----	0.32			
	39-60	---	---	0.00-0.6	---	---	-------------	----			
FeA:											
Fairchild-------	0-4	2-8	1.25-1.45	2.0-20	0.06-0.12	3.5-7.3	Low----------	0.02	3	1	2-5
	4-13	1-6	1.35-1.65	6.0-20	0.06-0.10	3.5-6.0	Low----------	0.15			
	13-21	2-8	1.45-1.65	6.0-20	0.06-0.10	3.5-6.0	Low----------	0.15			
	21-32	2-8	1.50-1.65	6.0-20	0.06-0.10	3.5-6.0	Low----------	0.15			
	32-39	10-35	1.45-1.70	0.2-2.0	0.10-0.19	3.5-5.5	Moderate-----	0.32			
	39-60	---	---	0.00-0.6	---	---	-------------	----			
Elm Lake--------	0-4	---	0.15-0.45	0.2-6.0	0.35-0.45	3.6-6.0	Low----------	0.10	3	2	50-80
	4-28	2-8	1.45-1.65	6.0-60	0.06-0.10	3.6-6.0	Low----------	0.15			
	28-38	10-35	1.45-1.70	0.2-2.0	0.10-0.19	3.6-5.5	Moderate-----	0.43			
	38-60	---	---	0.00-0.6	---	---	-------------	----			
GaC2, GaD2------- Gale	0-8	12-20	1.35-1.45	0.6-2.0	0.22-0.24	4.5-7.3	Low----------	0.43	3	5	1-3
	8-27	20-32	1.45-1.55	0.6-2.0	0.18-0.22	4.5-6.5	Moderate-----	0.37			
	27-31	18-30	1.45-1.55	0.6-2.0	0.17-0.22	4.5-6.5	Moderate-----	0.37			
	31-39	1-14	1.30-1.50	6.0-20	0.05-0.14	4.5-6.5	Low----------	0.15			
	39-60	---	---	0.2-2.0	---	---	-------------	----			

Table 18.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
GoB, GoC---------Gosil	0-9	2-4	1.35-1.55	6.0-20	0.09-0.12	4.5-7.3	Low-----------	0.10	5	2	.5-2
	9-27	5-10	1.40-1.60	6.0-20	0.09-0.13	5.1-6.5	Low-----------	0.17			
	27-36	3-5	1.40-1.60	6.0-20	0.05-0.11	5.1-6.5	Low-----------	0.15			
	36-60	1-3	1.50-1.70	6.0-20	0.04-0.07	5.1-6.5	Low-----------	0.15			
HkB:											
Hiles------------	0-8	10-20	1.35-1.55	0.6-2.0	0.22-0.24	4.5-7.3	Low-----------	0.37	3	5	1-3
	8-12	10-20	1.45-1.65	0.6-2.0	0.18-0.22	4.5-6.0	Low-----------	0.43			
	12-20	20-27	1.45-1.65	0.6-2.0	0.18-0.22	4.5-6.0	Moderate------	0.43			
	20-28	20-35	1.55-1.70	0.2-2.0	0.13-0.18	3.5-5.5	Moderate------	0.32			
	28-60	---	---	0.00-0.6	---	---	--------------	----			
Kert-------------	0-3	10-20	1.40-1.55	0.6-2.0	0.22-0.24	4.5-7.3	Low-----------	0.37	3	5	2-4
	3-8	6-18	1.40-1.70	0.6-2.0	0.18-0.24	4.5-6.0	Low-----------	0.43			
	8-19	18-30	1.55-1.70	0.6-2.0	0.18-0.22	4.5-6.0	Moderate------	0.43			
	19-31	20-35	1.55-1.70	0.2-2.0	0.15-0.20	3.5-5.5	Moderate------	0.37			
	31-60	---	---	0.00-0.6	---	---	--------------	----			
HnB, HnC2, HnD2--Hixton	0-9	12-16	1.35-1.55	0.6-2.0	0.20-0.22	5.1-6.5	Low-----------	0.32	3	5	1-2
	9-32	18-27	1.55-1.65	0.6-2.0	0.12-0.19	5.1-6.5	Low-----------	0.32			
	32-39	2-6	1.55-1.70	6.0-20	0.05-0.10	5.1-6.5	Low-----------	0.15			
	39-60	---	---	0.2-2.0	---	---	--------------	----			
HpA---------------Hoop	0-11	8-14	1.35-1.70	0.6-2.0	0.11-0.15	4.5-7.3	Low-----------	0.20	4	3	2-3
	11-24	10-17	1.45-1.70	0.6-2.0	0.10-0.17	4.5-6.5	Low-----------	0.20			
	24-34	2-10	1.50-1.75	>6.0	0.03-0.11	5.1-6.5	Low-----------	0.15			
	34-60	1-8	1.50-1.80	>6.0	0.02-0.08	5.1-6.5	Low-----------	0.15			
Ht----------------Houghton	0-60	---	0.15-0.45	0.2-6.0	0.35-0.45	6.1-7.3	--------------	----	3	2	>70
HuB---------------Humbird	0-3	6-13	1.35-1.60	0.6-6.0	0.12-0.18	4.5-7.3	Low-----------	0.28	3	3	1-3
	3-6	2-6	1.35-1.65	0.6-6.0	0.09-0.14	4.5-6.0	Low-----------	0.17			
	6-18	8-17	1.45-1.70	0.6-6.0	0.09-0.14	4.5-6.0	Low-----------	0.24			
	18-30	35-60	1.50-1.75	0.06-0.2	0.08-0.13	3.5-5.5	High----------	0.32			
	30-60	---	---	0.00-0.6	---	---	--------------	----			
HxB:											
Humbird----------	0-3	6-13	1.35-1.60	0.6-6.0	0.12-0.18	4.5-7.3	Low-----------	0.28	3	3	1-3
	3-6	2-6	1.35-1.65	0.6-6.0	0.09-0.14	4.5-6.0	Low-----------	0.17			
	6-18	8-17	1.45-1.70	0.6-6.0	0.09-0.14	4.5-6.0	Low-----------	0.24			
	18-30	35-60	1.50-1.75	0.06-0.2	0.08-0.13	3.5-5.5	High----------	0.32			
	30-60	---	---	0.00-0.6	---	---	--------------	----			
Merrillan--------	0-4	6-13	1.35-1.70	0.6-6.0	0.13-0.15	4.5-7.3	Low-----------	0.28	3	3	3-5
	4-6	8-14	1.35-1.55	0.6-6.0	0.20-0.22	4.5-6.0	Low-----------	0.24			
	6-15	8-14	1.35-1.65	0.6-6.0	0.10-0.12	4.5-6.0	Low-----------	0.24			
	15-21	10-18	1.50-1.70	0.6-6.0	0.06-0.14	4.5-6.0	Low-----------	0.24			
	21-31	35-60	1.50-1.70	0.06-0.2	0.13-0.20	3.5-5.5	Moderate------	0.32			
	31-60	---	---	0.00-0.6	---	---	--------------	----			
ImA---------------Impact	0-14	3-5	1.35-1.65	6.0-20	0.08-0.10	5.1-6.5	Low-----------	0.02	5	1	1-2
	14-30	0-6	1.50-1.65	6.0-20	0.05-0.13	4.5-6.0	Low-----------	0.15			
	30-60	0-2	1.50-1.65	6.0-20	0.05-0.07	5.1-6.5	Low-----------	0.15			
IrA---------------Ironrun	0-4	3-7	1.35-1.60	6.0-20	0.06-0.09	3.5-7.3	Low-----------	0.02	5	1	2-5
	4-12	3-5	1.50-1.65	>6.0	0.05-0.08	3.5-7.3	Low-----------	0.15			
	12-16	3-5	1.50-1.65	>6.0	0.05-0.09	3.5-6.0	Low-----------	0.15			
	16-30	3-5	1.50-1.65	>6.0	0.05-0.09	3.5-6.0	Low-----------	0.15			
	30-62	3-5	1.50-1.65	>6.0	0.04-0.07	5.1-6.5	Low-----------	0.15			

Table 18.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
IxA:											
Ironrun----------	0-4	3-7	1.35-1.60	6.0-20	0.06-0.09	3.5-7.3	Low-----------	0.02	5	1	2-5
	4-12	3-5	1.50-1.65	>6.0	0.05-0.08	3.5-7.3	Low-----------	0.15			
	12-16	3-5	1.50-1.65	>6.0	0.05-0.09	3.5-6.0	Low-----------	0.15			
	16-30	3-5	1.50-1.65	>6.0	0.05-0.09	3.5-6.0	Low-----------	0.15			
	30-62	3-5	1.50-1.65	>6.0	0.04-0.07	5.1-6.5	Low-----------	0.15			
Ponycreek--------	0-4	---	0.30-0.50	0.2-6.0	0.35-0.45	3.5-6.5	--------------	0.05	5	2	20-70
	4-6	4-8	1.35-1.65	>6.0	0.09-0.12	3.5-6.5	Low-----------	0.15			
	6-29	4-8	1.50-1.70	>6.0	0.06-0.11	3.5-6.5	Low-----------	0.15			
	29-64	3-5	1.50-1.70	>6.0	0.05-0.07	4.5-6.5	Low-----------	0.15			
IzB:											
Ironrun----------	0-4	3-7	1.35-1.60	6.0-20	0.06-0.09	3.5-7.3	Low-----------	0.02	5	1	2-5
	4-12	3-5	1.50-1.65	>6.0	0.05-0.08	3.5-7.3	Low-----------	0.15			
	12-16	3-5	1.50-1.65	>6.0	0.05-0.09	3.5-6.0	Low-----------	0.15			
	16-30	3-5	1.50-1.65	>6.0	0.05-0.09	3.5-6.0	Low-----------	0.15			
	30-62	3-5	1.50-1.65	>6.0	0.04-0.07	5.1-6.5	Low-----------	0.15			
Ponycreek--------	0-4	---	0.30-0.50	0.2-6.0	0.35-0.45	3.5-6.5	--------------	0.05	5	2	20-70
	4-6	4-8	1.35-1.65	>6.0	0.09-0.12	3.5-6.5	Low-----------	0.15			
	6-29	4-8	1.50-1.70	>6.0	0.06-0.11	3.5-6.5	Low-----------	0.15			
	29-64	3-5	1.50-1.70	>6.0	0.05-0.07	4.5-6.5	Low-----------	0.15			
Arbutus----------	0-3	2-10	1.30-1.60	6.0-20	0.09-0.12	3.5-6.0	Low-----------	0.10	2	2	.5-2
	3-6	1-10	1.30-1.60	6.0-20	0.07-0.11	3.5-6.0	Low-----------	0.17			
	6-17	1-10	1.45-1.65	6.0-20	0.07-0.11	3.5-6.0	Low-----------	0.17			
	17-32	1-10	1.40-1.70	6.0-20	0.05-0.11	3.5-6.0	Low-----------	0.15			
	32-36	---	---	0.01-20	---	---	--------------	----			
JaA, JaB---------- Jackson	0-9	15-22	1.35-1.60	0.6-2.0	0.22-0.24	5.6-7.3	Low-----------	0.37	4	5	2-3
	9-50	18-30	1.55-1.65	0.6-2.0	0.18-0.22	5.6-7.3	Moderate------	0.37			
	50-60	1-4	1.55-1.65	6.0-20	0.05-0.09	5.1-6.5	Low-----------	0.15			
Ka---------------- Kalmarville	0-6	13-23	1.35-1.45	0.6-2.0	0.20-0.24	6.6-7.8	Low-----------	0.32	4	5	2-4
	6-42	8-18	1.40-1.50	2.0-6.0	0.13-0.18	6.6-7.8	Low-----------	0.20			
	42-60	2-5	1.55-1.65	6.0-20	0.06-0.09	6.6-7.8	Low-----------	0.10			
KeA--------------- Kert	0-3	10-20	1.40-1.55	0.6-2.0	0.22-0.24	4.5-7.3	Low-----------	0.37	3	5	2-5
	3-8	6-18	1.40-1.70	0.6-2.0	0.18-0.24	4.5-6.0	Low-----------	0.43			
	8-19	18-30	1.55-1.70	0.6-2.0	0.18-0.22	4.5-6.0	Moderate------	0.43			
	19-31	20-35	1.55-1.70	0.2-2.0	0.15-0.20	3.5-5.5	Moderate------	0.37			
	31-60	---	---	0.00-0.6	---	---	--------------	----			
LfC2, LfD2-------- La Farge	0-6	14-17	1.35-1.55	0.6-2.0	0.22-0.24	4.5-7.3	Low-----------	0.43	3	5	1-3
	6-28	20-30	1.35-1.75	0.6-2.0	0.18-0.22	4.5-6.5	Moderate------	0.37			
	28-37	6-30	1.55-1.70	0.6-2.0	0.15-0.19	4.5-6.5	Moderate------	0.37			
	37-60	---	---	0.06-2.0	---	---	--------------	----			
LsD2:											
La Farge---------	0-6	14-17	1.35-1.55	0.6-2.0	0.22-0.24	4.5-7.3	Low-----------	0.43	3	5	1-3
	6-28	20-30	1.35-1.75	0.6-2.0	0.18-0.22	4.5-6.5	Moderate------	0.37			
	28-37	6-30	1.55-1.70	0.6-2.0	0.15-0.19	4.5-6.5	Moderate------	0.37			
	37-60	---	---	0.06-2.0	---	---	--------------	----			
Seaton-----------	0-9	15-22	1.10-1.20	0.6-2.0	0.22-0.24	5.6-7.3	Low-----------	0.49	5	5	1-3
	9-46	18-27	1.15-1.30	0.6-2.0	0.20-0.22	4.5-7.3	Low-----------	0.37			
	46-60	15-25	1.20-1.40	0.6-2.0	0.20-0.22	5.6-8.4	Low-----------	0.37			
Lt---------------- Loxley	0-4	---	0.30-0.40	>6.0	0.35-0.65	<4.5	--------------	----	3	7	70-90
	4-60	---	0.10-0.35	0.2-6.0	0.35-0.45	<4.5	--------------	----			

Table 18.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
LuB---------------Ludington	0-4	2-4	1.35-1.55	2.0-20	0.04-0.09	3.5-7.3	Low-----------	0.02	3	1	1-4
	4-6	1-6	1.35-1.65	6.0-20	0.06-0.10	3.5-6.0	Low-----------	0.15			
	6-20	2-8	1.45-1.65	6.0-20	0.06-0.10	3.5-6.0	Low-----------	0.15			
	20-28	2-8	1.50-1.65	6.0-20	0.06-0.10	3.5-6.0	Low-----------	0.15			
	28-39	10-35	1.45-1.70	0.2-2.0	0.10-0.19	3.5-5.5	Moderate-----	0.32			
	39-60	---	---	0.00-0.6	---	---	--------------	----			
LxB:											
Ludington--------	0-3	2-4	1.35-1.55	2.0-20	0.04-0.09	3.5-7.3	Low-----------	0.02	3	1	1-4
	3-13	1-6	1.35-1.65	6.0-20	0.06-0.10	3.5-6.0	Low-----------	0.15			
	13-20	2-8	1.45-1.65	6.0-20	0.06-0.10	3.5-6.0	Low-----------	0.15			
	20-27	2-8	1.50-1.65	6.0-20	0.06-0.10	3.5-6.0	Low-----------	0.15			
	27-39	10-35	1.45-1.70	0.2-2.0	0.10-0.19	3.5-5.5	Moderate-----	0.32			
	39-60	---	---	0.00-0.6	---	---	--------------	----			
Fairchild--------	0-4	2-8	1.25-1.45	2.0-20	0.06-0.12	3.5-7.3	Low-----------	0.02	3	1	2-5
	4-13	1-6	1.35-1.65	6.0-20	0.06-0.10	3.5-6.0	Low-----------	0.15			
	13-21	2-8	1.45-1.65	6.0-20	0.06-0.10	3.5-6.0	Low-----------	0.15			
	21-32	2-8	1.50-1.65	6.0-20	0.06-0.10	3.5-6.0	Low-----------	0.15			
	32-39	10-35	1.45-1.70	0.2-2.0	0.10-0.19	3.5-5.5	Moderate-----	0.32			
	39-60	---	---	0.00-0.6	---	---	--------------	----			
MaB---------------Mahtomedi	0-4	2-15	1.40-1.60	6.0-20	0.10-0.12	5.1-6.5	Low-----------	0.10	5	2	.5-2
	4-20	0-10	1.40-1.50	6.0-20	0.06-0.08	5.1-6.5	Low-----------	0.10			
	20-26	0-10	1.45-1.75	6.0-20	0.05-0.07	5.1-6.5	Low-----------	0.05			
	26-60	0-10	1.45-1.75	6.0-20	0.04-0.09	5.1-7.8	Low-----------	0.05			
MbA---------------Majik	0-4	4-10	1.35-1.65	2.0-6.0	0.09-0.12	4.5-7.3	Low-----------	0.15	5	2	2-5
	4-7	4-10	1.35-1.65	6.0-20	0.06-0.12	4.5-7.3	Low-----------	0.15			
	7-29	2-8	1.45-1.65	6.0-20	0.05-0.11	4.5-6.0	Low-----------	0.17			
	29-60	1-5	1.50-1.70	6.0-20	0.04-0.07	5.6-7.3	Low-----------	0.15			
MmA---------------Merimod	0-9	12-20	1.35-1.55	0.6-2.0	0.20-0.24	4.5-7.3	Low-----------	0.32	4	5	2-3
	9-17	18-27	1.40-1.65	0.6-2.0	0.18-0.22	4.5-6.5	Moderate-----	0.43			
	17-32	18-27	1.50-1.65	0.6-2.0	0.10-0.20	4.5-6.5	Moderate-----	0.32			
	32-60	1-6	1.65-1.85	6.0-20	0.03-0.07	4.5-6.5	Low-----------	0.15			
MnB---------------Merit	0-9	12-20	1.35-1.55	0.6-2.0	0.20-0.24	4.5-7.3	Low-----------	0.32	4	5	2-3
	9-12	18-27	1.40-1.65	0.6-2.0	0.18-0.22	4.5-6.5	Moderate-----	0.43			
	12-30	18-27	1.50-1.65	0.6-2.0	0.10-0.20	4.5-6.5	Moderate-----	0.32			
	30-60	1-6	1.65-1.85	6.0-20	0.03-0.07	4.5-6.5	Low-----------	0.15			
MoB:											
Merit------------	0-9	12-20	1.35-1.55	0.6-2.0	0.20-0.24	4.5-7.3	Low-----------	0.32	4	5	2-3
	9-12	18-27	1.40-1.65	0.6-2.0	0.18-0.22	4.5-6.5	Moderate-----	0.43			
	12-30	18-27	1.50-1.65	0.6-2.0	0.10-0.20	4.5-6.5	Moderate-----	0.32			
	30-60	1-6	1.65-1.85	6.0-20	0.03-0.07	4.5-6.5	Low-----------	0.15			
Gardenvale-------	0-8	14-20	1.35-1.55	0.6-2.0	0.22-0.24	4.5-7.3	Low-----------	0.37	4	5	2-4
	8-26	18-27	1.35-1.55	0.6-2.0	0.20-0.22	4.5-6.0	Low-----------	0.43			
	26-30	14-27	1.55-1.65	0.6-2.0	0.16-0.22	4.5-6.0	Moderate-----	0.24			
	30-50	1-10	1.50-1.70	6.0-20	0.05-0.08	4.5-6.0	Low-----------	0.15			
	50-60	---	---	0.2-2.0	---	---	--------------	----			
MpA---------------Merrillan	0-5	6-13	1.35-1.70	0.6-6.0	0.13-0.15	4.5-7.3	Low-----------	0.28	3	3	3-5
	5-10	8-14	1.35-1.55	0.6-6.0	0.20-0.22	4.5-6.0	Low-----------	0.24			
	10-18	8-14	1.35-1.65	0.6-6.0	0.10-0.12	4.5-6.0	Low-----------	0.24			
	18-24	10-18	1.50-1.70	0.6-6.0	0.06-0.14	4.5-6.0	Low-----------	0.24			
	24-34	35-60	1.50-1.70	0.06-0.2	0.13-0.20	3.5-5.5	Moderate-----	0.32			
	34-60	---	---	0.00-0.6	---	---	--------------	----			

Table 18.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
MrA:											
Merrillan-------	0-4	6-13	1.35-1.70	0.6-6.0	0.13-0.15	4.5-7.3	Low-----------	0.28	3	3	3-5
	4-6	8-14	1.35-1.55	0.6-6.0	0.20-0.22	4.5-6.0	Low-----------	0.24			
	6-15	8-14	1.35-1.65	0.6-6.0	0.10-0.12	4.5-6.0	Low-----------	0.24			
	15-21	10-18	1.50-1.70	0.6-6.0	0.06-0.14	4.5-6.0	Low-----------	0.24			
	21-31	35-60	1.50-1.70	0.06-0.2	0.13-0.20	3.5-5.5	Moderate-----	0.32			
	31-60	---	---	0.00-0.6	---	---	--------------	----			
Veedum-----------	0-3	---	0.25-0.85	0.2-0.6	0.35-0.45	3.5-6.0	--------------	0.37	3	2	20-40
	3-9	8-20	1.40-1.70	0.6-2.0	0.18-0.22	3.5-6.0	Low-----------	0.43			
	9-17	18-30	1.40-1.70	0.6-2.0	0.18-0.22	3.5-6.0	Low-----------	0.43			
	17-33	18-35	1.55-1.70	0.2-2.0	0.15-0.20	3.5-6.0	Moderate-----	0.37			
	33-60	---	---	0.00-0.6	---	---	--------------	----			
MxA:											
Moppet-----------	0-4	10-15	1.40-1.70	0.6-6.0	0.13-0.22	3.6-6.0	Low-----------	0.28	4	3	2-3
	4-32	8-17	1.45-1.70	0.6-6.0	0.15-0.22	3.6-6.0	Low-----------	0.24			
	32-60	2-10	1.60-1.75	6.0-20	0.03-0.09	3.6-6.5	Low-----------	0.10			
Fordum-----------	0-6	10-23	1.35-1.45	0.6-2.0	0.17-0.24	4.5-8.4	Low-----------	0.32	4	8	4-12
	6-35	8-17	1.40-1.50	0.6-6.0	0.10-0.22	4.5-8.4	Low-----------	0.37			
	35-60	2-5	1.55-1.70	>6.0	0.04-0.10	5.6-8.4	Low-----------	0.15			
Ne----------------	0-3	---	0.30-0.50	0.2-6.0	0.35-0.45	3.5-6.0	--------------	0.05	5	2	20-70
Newlang	3-6	4-10	1.35-1.65	6.0-20	0.06-0.18	3.5-6.0	Low-----------	0.17			
	6-22	5-10	1.50-1.70	6.0-20	0.06-0.11	5.6-7.3	Low-----------	0.15			
	22-63	3-5	1.50-1.70	6.0-20	0.05-0.10	5.6-7.3	Low-----------	0.15			
OrA---------------	0-8	10-18	1.20-1.30	0.6-2.0	0.22-0.24	5.6-7.8	Low-----------	0.37	5	5	1-3
Orion	8-32	10-18	1.20-1.30	0.6-2.0	0.20-0.22	5.6-7.8	Low-----------	0.37			
	32-40	10-30	1.25-1.45	0.6-2.0	0.18-0.22	5.6-7.8	Low-----------	0.37			
	40-60	10-18	1.20-1.40	0.6-2.0	0.18-0.22	5.6-7.8	Low-----------	0.37			
Pa----------------	0-40	---	0.25-0.45	0.2-6.0	0.35-0.45	5.1-7.8	--------------	----	2	2	>75
Palms	40-60	7-35	1.45-1.75	0.2-2.0	0.14-0.22	6.1-8.4	Low-----------	0.37			
Pt.											
Pits											
Pu----------------	0-4	---	0.30-0.50	0.2-6.0	0.35-0.45	3.5-6.5	--------------	0.05	5	2	20-70
Ponycreek	4-6	4-8	1.35-1.65	>6.0	0.09-0.12	3.5-6.5	Low-----------	0.15			
	6-29	4-8	1.50-1.70	>6.0	0.06-0.11	3.5-6.5	Low-----------	0.15			
	29-64	3-5	1.50-1.70	>6.0	0.05-0.07	4.5-6.5	Low-----------	0.15			
Pv:											
Ponycreek-------	0-6	---	0.30-0.50	0.2-6.0	0.35-0.45	3.5-6.5	--------------	0.05	5	2	20-70
	6-8	4-8	1.35-1.65	>6.0	0.09-0.12	3.5-6.5	Low-----------	0.15			
	8-21	4-8	1.50-1.70	>6.0	0.06-0.11	3.5-6.5	Low-----------	0.15			
	21-66	3-5	1.50-1.70	>6.0	0.05-0.07	4.5-6.5	Low-----------	0.15			
Dawsil-----------	0-20	---	0.20-0.35	0.6-6.0	0.45-0.55	3.6-4.4	--------------	----	2	5	65-85
	20-40	---	0.15-0.40	0.2-6.0	0.35-0.45	3.6-4.4	--------------	0.10			
	40-60	0-10	1.55-1.70	6.0-20	0.03-0.10	3.6-6.5	Low-----------	0.15			
Pw----------------	0-6	0-3	1.35-1.60	6.0-20	0.07-0.09	5.1-6.5	Low-----------	0.02	5	8	1-10
Psammaquents	6-60	0-3	1.45-1.70	6.0-20	0.05-0.08	5.1-6.5	Low-----------	0.15			

Table 18.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
RkA---------------- Rockdam	0-3	3-5	1.35-1.60	6.0-20	0.06-0.09	3.5-7.3	Low-----------	0.02	5	1	1-3
	3-6	1-5	1.50-1.65	>6.0	0.05-0.08	3.5-7.3	Low-----------	0.15			
	6-19	1-5	1.50-1.65	>6.0	0.04-0.07	3.5-6.0	Low-----------	0.15			
	19-27	1-5	1.50-1.65	>6.0	0.04-0.07	3.5-6.5	Low-----------	0.15			
	27-61	1-5	1.50-1.65	>6.0	0.04-0.07	4.5-6.5	Low-----------	0.15			
RoA---------------- Rowley	0-11	15-22	1.35-1.45	0.6-2.0	0.22-0.24	5.1-7.3	Low-----------	0.28	4	5	2-5
	11-38	20-27	1.35-1.65	0.6-2.0	0.18-0.22	5.1-7.3	Low-----------	0.43			
	38-50	10-20	1.55-1.65	0.6-2.0	0.12-0.16	5.1-7.3	Low-----------	0.43			
	50-60	1-4	1.55-1.65	6.0-20	0.05-0.07	5.6-7.3	Low-----------	0.15			
SeB---------------- Seaton	0-9	10-22	1.10-1.45	0.6-2.0	0.22-0.24	5.6-7.3	Low-----------	0.43	5	5	1-3
	9-46	18-27	1.20-1.60	0.6-2.0	0.20-0.22	4.5-7.3	Low-----------	0.37			
	46-60	10-25	1.20-1.50	0.6-2.0	0.20-0.22	5.6-8.4	Low-----------	0.37			
SeC2--------------- Seaton	0-9	15-22	1.10-1.20	0.6-2.0	0.22-0.24	5.6-7.3	Low-----------	0.49	5	5	1-3
	9-46	18-27	1.15-1.30	0.6-2.0	0.20-0.22	4.5-7.3	Low-----------	0.37			
	46-60	15-25	1.20-1.40	0.6-2.0	0.20-0.22	5.6-8.4	Low-----------	0.37			
SmB---------------- Sebbo	0-9	15-22	1.35-1.60	0.6-2.0	0.16-0.22	4.5-7.3	Low-----------	0.24	5	5	2-5
	9-44	18-26	1.50-1.65	0.6-2.0	0.14-0.22	4.5-6.5	Low-----------	0.32			
	44-60	15-22	1.50-1.65	0.6-2.0	0.12-0.20	5.1-7.3	Low-----------	0.43			
SnA---------------- Sechler	0-9	8-17	1.35-1.55	0.6-2.0	0.20-0.24	3.5-7.3	Low-----------	0.32	4	5	2-5
	9-12	8-17	1.40-1.65	0.6-2.0	0.12-0.18	3.5-5.5	Low-----------	0.28			
	12-16	8-17	1.40-1.65	0.6-2.0	0.08-0.16	3.5-5.5	Low-----------	0.24			
	16-22	6-15	1.40-1.65	0.6-2.0	0.06-0.12	3.5-5.5	Low-----------	0.17			
	22-27	2-6	1.45-1.65	2.0-6.0	0.05-0.10	3.5-5.5	Low-----------	0.17			
	27-60	1-4	1.55-1.70	6.0-20	0.05-0.07	4.5-6.0	Low-----------	0.15			
SoA---------------- Sooner	0-9	12-20	1.35-1.55	0.6-2.0	0.20-0.24	4.5-7.3	Low-----------	0.32	4	5	2-5
	9-15	18-27	1.40-1.65	0.6-2.0	0.18-0.22	4.5-6.5	Moderate------	0.43			
	15-27	18-27	1.50-1.65	0.6-2.0	0.12-0.20	4.5-6.5	Moderate------	0.32			
	27-31	18-27	1.50-1.65	0.6-2.0	0.10-0.18	4.5-6.5	Moderate------	0.24			
	31-60	1-6	1.65-1.85	>6.0	0.03-0.07	5.1-6.5	Low-----------	0.15			
SpA---------------- Sparta	0-16	1-5	1.30-1.50	6.0-20	0.06-0.09	5.1-7.3	Low-----------	0.02	5	1	1-2
	16-42	1-8	1.40-1.60	6.0-20	0.05-0.11	5.1-7.3	Low-----------	0.15			
	42-60	0-5	1.50-1.70	6.0-20	0.04-0.07	5.1-7.8	Low-----------	0.15			
TrB, TrC----------- Tarr	0-8	3-5	1.35-1.65	6.0-20	0.08-0.10	3.5-7.3	Low-----------	0.02	5	1	.5-2
	8-36	3-8	1.50-1.65	6.0-20	0.05-0.07	3.5-6.0	Low-----------	0.15			
	36-60	3-8	1.50-1.65	6.0-20	0.05-0.07	4.5-6.5	Low-----------	0.15			
TrF---------------- Tarr	0-2	3-5	1.35-1.65	6.0-20	0.08-0.10	3.5-7.3	Low-----------	0.02	5	1	.5-2
	2-30	3-8	1.50-1.65	6.0-20	0.05-0.07	3.5-6.0	Low-----------	0.15			
	30-60	3-8	1.50-1.65	6.0-20	0.05-0.07	4.5-6.5	Low-----------	0.15			
TtA---------------- Tint	0-9	4-8	1.35-1.65	6.0-20	0.06-0.09	4.5-7.3	Low-----------	0.02	5	1	.5-2
	9-29	0-5	1.45-1.65	6.0-20	0.05-0.08	4.5-6.0	Low-----------	0.15			
	29-60	0-5	1.50-1.70	6.0-20	0.04-0.07	5.1-6.5	Low-----------	0.15			
TuB---------------- Tintson	0-8	5-10	1.35-1.65	6.0-20	0.07-0.09	4.5-7.3	Low-----------	0.02	5	1	.5-2
	8-46	0-5	1.45-1.65	6.0-20	0.05-0.08	4.5-6.0	Low-----------	0.15			
	46-60	3-20	1.50-1.70	0.6-2.0	0.13-0.22	4.5-6.0	Low-----------	0.32			
TwA---------------- Toddville	0-17	15-22	1.35-1.45	0.6-2.0	0.22-0.24	5.6-7.3	Low-----------	0.28	4	5	3-7
	17-42	18-30	1.55-1.65	0.6-2.0	0.18-0.22	5.1-7.3	Moderate------	0.43			
	42-55	10-20	1.55-1.65	0.6-2.0	0.12-0.16	5.1-7.3	Low-----------	0.43			
	55-60	1-4	1.55-1.65	6.0-20	0.05-0.07	5.6-7.3	Low-----------	0.15			

Table 18.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
UdF----------------- Udorthents	0-60	5-30	---	0.6-6.0	0.12-0.20	4.5-7.8	Low-----------	0.32	5	3	0-1
UfC2, UfD2-------- Urne	0-2	7-15	1.35-1.65	2.0-6.0	0.15-0.22	5.1-7.8	Low-----------	0.32	3	3	.5-1
	2-36	10-18	1.55-1.65	0.6-6.0	0.09-0.19	5.1-7.8	Low-----------	0.37			
	36-60	---	---	0.06-2.0	---	---	-------------	----			
UrF:											
Urne---------------	0-2	7-15	1.35-1.65	2.0-6.0	0.15-0.22	5.1-7.8	Low-----------	0.28	3	3	.5-2
	2-36	10-18	1.55-1.65	0.6-6.0	0.09-0.19	5.1-7.8	Low-----------	0.37			
	36-60	---	---	0.06-2.0	---	---	-------------	----			
Council----------	0-7	6-10	1.35-1.60	0.6-2.0	0.17-0.24	4.5-7.3	Low-----------	0.32	5	5	1-2
	7-45	10-17	1.55-1.65	0.6-2.0	0.14-0.22	4.5-6.5	Low-----------	0.32			
	45-60	6-17	1.55-1.65	0.6-2.0	0.12-0.20	5.1-7.3	Low-----------	0.24			
Vs:											
Veedum-----------	0-7	---	0.15-0.55	2.0-6.0	0.35-0.45	3.5-6.0	Low-----------	0.37	3	2	20-50
	7-11	8-20	1.40-1.70	0.6-2.0	0.18-0.22	3.5-6.0	Low-----------	0.43			
	11-21	18-30	1.40-1.70	0.6-2.0	0.18-0.22	3.5-6.0	Low-----------	0.43			
	21-31	18-35	1.55-1.70	0.2-2.0	0.15-0.20	3.5-6.0	Moderate-----	0.37			
	31-67	---	---	0.00-0.6	---	---	-------------	----			
Elm Lake---------	0-6	---	0.15-0.45	0.2-6.0	0.35-0.45	3.6-6.0	Low-----------	0.10	3	2	50-80
	6-28	2-8	1.45-1.65	6.0-20	0.06-0.10	3.6-6.0	Low-----------	0.15			
	28-38	10-35	1.45-1.70	0.2-2.0	0.10-0.19	3.6-5.5	Moderate-----	0.43			
	38-60	---	---	0.00-0.6	---	---	-------------	----			
WmA--------------- Whitehall	0-12	15-25	1.35-1.55	0.6-2.0	0.22-0.24	6.1-7.3	Low-----------	0.32	4	5	3-4
	12-28	24-32	1.55-1.65	0.6-2.0	0.18-0.22	4.5-6.0	Moderate-----	0.43			
	28-32	15-27	1.55-1.65	0.6-2.0	0.20-0.22	4.5-6.0	Low-----------	0.43			
	32-60	1-5	1.55-1.70	>6.0	0.05-0.10	4.5-5.5	Low-----------	0.15			

Table 19.--Soil and Water Features

("Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

Soil name and map symbol	Hydro- logic group	Flooding			High water table			Bedrock		Total subsi- dence	Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hard- ness			Uncoated steel	Concrete
					Ft			In		In			
AbA-------------- Absco	A	Occasional	Brief-----	Mar-Jun	3.5-6.0	Apparent	Nov-Jun	>60	---	---	Low------	Low------	Low.
AcA:													
Absco----------	A	Occasional	Brief-----	Mar-Jun	3.5-6.0	Apparent	Nov-Jun	>60	---	---	Low------	Low------	Low.
Northbend------	C	Frequent----	Brief-----	Mar-Jun	1.0-2.0	Apparent	Nov-May	>60	---	---	High-----	High-----	Moderate.
Ad--------------- Adder	A/D	Frequent----	Long------	Oct-Jun	+1-1.0	Apparent	Sep-Jun	>60	---	29-33	High-----	High-----	Moderate.
ArA-------------- Arenzville	B	Occasional	Brief-----	Nov-Jun	3.5-6.0	Perched	Oct-May	>60	---	---	High-----	Moderate	Moderate.
BeB-------------- Bertrand	B	None--------	---	---	>6.0	---	---	>60	---	---	High-----	Low------	Moderate.
BkA-------------- Bilmod	B	None--------	---	---	3.5-6.0	Apparent	Oct-May	>60	---	---	Moderate	Low------	Moderate.
BlB-------------- Bilson	B	None--------	---	---	>6.0	---	---	>60	---	---	Moderate	Low------	Moderate.
BnB:													
Bilson---------	B	None--------	---	---	>6.0	---	---	>60	---	---	Moderate	Low------	Moderate.
Silverhill-----	B	None--------	---	---	>6.0	---	---	40-60	Soft	---	Moderate	Low------	Moderate.
BnC2, BnD2:													
Bilson---------	B	None--------	---	---	>6.0	---	---	>60	---	---	Moderate	Low------	Moderate.
Elevasil-------	B	None--------	---	---	>6.0	---	---	20-40	Soft	---	Moderate	Low------	Moderate.
BoB, BoC, BoF--- Boone	A	None--------	---	---	>6.0	---	---	20-40	Soft	---	Low------	Low------	Moderate.
BpF:													
Boone----------	A	None--------	---	---	>6.0	---	---	20-40	Soft	---	Low------	Low------	Moderate.
Elevasil-------	B	None--------	---	---	>6.0	---	---	20-40	Soft	---	Moderate	Low------	Moderate.
Cd--------------- Citypoint	A/D	None--------	---	---	+1-1.0	Perched	Oct-Jun	20-51	Soft	---	High-----	High-----	High.

Table 19.--Soil and Water Features--Continued

Soil name and map symbol	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Bedrock: Depth	Bedrock: Hard-ness	Total subsi-dence	Potential frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft			In		In			
CfA-------------- Coffton	B	Occasional	Brief-----	Mar-May	1.0-2.0	Apparent	Nov-May	>60	---	---	High-----	High-----	Moderate.
CoC2------------- Council	B	None---------	---	---	>6.0	---	---	>60	---	---	Moderate	Low------	Moderate.
CpC2, CpD2:													
Council---------	B	None---------	---	---	>6.0	---	---	>60	---	---	Moderate	Low------	Moderate.
Bilson----------	B	None---------	---	---	>6.0	---	---	>60	---	---	Moderate	Low------	Moderate.
CsD2, CsE:													
Council---------	B	None---------	---	---	>6.0	---	---	>60	---	---	Moderate	Low------	Moderate.
Seaton----------	B	None---------	---	---	>6.0	---	---	>60	---	---	High-----	Low------	Moderate.
Da--------------- Dawsil	A/D	None---------	---	---	+1-1.0	Apparent	Sep-Jun	>60	---	30-36	High-----	High-----	High.
DuA-------------- Dunnville	B	None---------	---	---	>6.0	---	---	>60	---	---	Low------	Moderate	Moderate.
ElB, ElC2, ElD2- Elevasil	B	None---------	---	---	>6.0	---	---	20-40	Soft	---	Moderate	Low------	Moderate.
Eo--------------- Elm Lake	A/D	None---------	---	---	+1-1.0	Perched	Oct-Jun	20-40	Soft	---	Moderate	High-----	High.
Et--------------- Ettrick	B/D	Frequent----	Brief or long.	Nov-May	+1-1.0	Apparent	Nov-Jun	>60	---	---	High-----	High-----	Low.
FaA-------------- Fairchild	C	None---------	---	---	1.0-2.0	Perched	Oct-Jun	20-40	Soft	---	Moderate	High-----	High.
FeA:													
Fairchild-------	C	None---------	---	---	1.0-2.0	Perched	Oct-Jun	20-40	Soft	---	Moderate	High-----	High.
Elm Lake--------	A/D	None---------	---	---	+1-1.0	Perched	Oct-Jun	20-40	Soft	---	Moderate	High-----	High.
GaC2, GaD2------- Gale	B	None---------	---	---	>6.0	---	---	20-40	Soft	---	High-----	Moderate	Moderate.
GoB, GoC--------- Gosil	A	None---------	---	---	>6.0	---	---	>60	---	---	Low------	Low------	High.
HkB:													
Hiles-----------	B	None---------	---	---	1.5-3.0	Perched	Oct-May	20-40	Soft	---	Moderate	Moderate	High.
Kert------------	C	None---------	---	---	1.0-2.5	Perched	Oct-May	20-40	Soft	---	High-----	High-----	High.

Table 19.--Soil and Water Features--Continued

Soil name and map symbol	Hydrologic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Bedrock: Depth	Bedrock: Hardness	Total subsidence	Potential frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft			In		In			
HnB, HnC2, HnD2-- Hixton	B	None--------	---	---	>6.0	---	---	20-40	Soft	---	Moderate	Low------	Moderate.
HpA-------------- Hoop	B	None--------	---	---	1.0-2.0	Apparent	Nov-May	>60	---	---	Moderate	Low------	Moderate.
Ht--------------- Houghton	A/D	Frequent----	Long------	Oct-May	+1-1.0	Apparent	Sep-Jun	>60	---	55-60	High-----	High-----	Low.
HuB-------------- Humbird	B	None--------	---	---	1.5-3.0	Perched	Oct-May	24-40	Soft	---	Moderate	High-----	High.
HxB:													
Humbird---------	B	None--------	---	---	1.5-3.0	Perched	Oct-May	24-40	Soft	---	Moderate	High-----	High.
Merrillan-------	C	None--------	---	---	1.0-2.0	Perched	Sep-Jun	20-40	Soft	---	High-----	High-----	High.
ImA-------------- Impact	A	None--------	---	---	>6.0	---	---	>60	---	---	Low------	Low------	High.
IrA-------------- Ironrun	B	None--------	---	---	1.0-2.0	Apparent	Nov-Jun	>60	---	---	Moderate	Low------	High.
IxA:													
Ironrun---------	B	None--------	---	---	1.0-2.0	Apparent	Nov-Jun	>60	---	---	Moderate	Low------	High.
Ponycreek-------	A/D	None--------	---	---	+1-1.0	Apparent	Oct-Jun	>60	---	---	Moderate	High-----	High.
IzB:													
Ironrun---------	B	None--------	---	---	1.0-2.0	Apparent	Nov-Jun	>60	---	---	Moderate	Low------	High.
Ponycreek-------	A/D	None--------	---	---	+1-1.0	Apparent	Oct-Jun	>60	---	---	Moderate	High-----	High.
Arbutus---------	A	None--------	---	---	>6.0	---	---	20-40	Hard	---	Low------	Low------	High.
JaA, JaB--------- Jackson	B	None--------	---	---	3.5-6.0	Apparent	Nov-Apr	>60	---	---	High-----	Moderate	Moderate.
Ka--------------- Kalmarville	B/D	Frequent----	Brief-----	Mar-Jun	0-1.0	Apparent	Nov-Aug	>60	---	---	High-----	Moderate	Low.
KeA-------------- Kert	C	None--------	---	---	1.0-2.5	Perched	Oct-May	20-40	Soft	---	High-----	High-----	High.
LfC2, LfD2------- La Farge	B	None--------	---	---	>6.0	---	---	24-40	Soft	---	High-----	Moderate	Moderate.
LsD2:													
La Farge--------	B	None--------	---	---	>6.0	---	---	24-40	Soft	---	High-----	Moderate	Moderate.

Table 19.--Soil and Water Features--Continued

Soil name and map symbol	Hydrologic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Bedrock: Depth	Bedrock: Hardness	Total subsidence	Potential frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft			In		In			
LsD2:													
Seaton----------	B	None---------	---	---	>6.0	---	---	>60	---	---	High------	Low-------	Moderate.
Lt--------------- Loxley	A/D	None---------	---	---	+1-1.0	Apparent	Oct-May	>60	---	50-55	High------	High------	High.
LuB-------------- Ludington	B	None---------	---	---	1.5-3.5	Perched	Oct-May	20-40	Soft	---	Low-------	Moderate	High.
LxB:													
Ludington-------	B	None---------	---	---	1.5-3.5	Perched	Oct-May	20-40	Soft	---	Low-------	Moderate	High.
Fairchild-------	C	None---------	---	---	1.0-2.0	Perched	Oct-Jun	20-40	Soft	---	Moderate	High------	High.
MaB-------------- Mahtomedi	A	None---------	---	---	>6.0	---	---	>60	---	---	Low-------	Low-------	High.
MbA-------------- Majik	B	None---------	---	---	1.0-2.5	Apparent	Oct-Jun	>60	---	---	Moderate	Low-------	High.
MmA-------------- Merimod	B	None---------	---	---	3.5-6.0	Apparent	Oct-May	>60	---	---	Moderate	Low-------	Moderate.
MnB-------------- Merit	B	None---------	---	---	>6.0	---	---	>60	---	---	Moderate	Low-------	Moderate.
MoB:													
Merit-----------	B	None---------	---	---	>6.0	---	---	>60	---	---	Moderate	Low-------	Moderate.
Gardenvale------	B	None---------	---	---	>6.0	---	---	40-60	Soft	---	Moderate	Low-------	Moderate.
MpA-------------- Merrillan	C	None---------	---	---	1.0-2.0	Perched	Sep-Jun	20-40	Soft	---	High------	High------	High.
MrA:													
Merrillan-------	C	None---------	---	---	1.0-2.0	Perched	Sep-Jun	20-40	Soft	---	High------	High------	High.
Veedum----------	D	None---------	---	---	+1-1.0	Perched	Sep-Jun	20-40	Soft	---	High------	High------	High.
MxA:													
Moppet----------	B	Occasional	Very brief	Sep-Jun	2.5-3.5	Apparent	Sep-Jun	>60	---	---	Moderate	Moderate	Moderate.
Fordum----------	D	Frequent----	Long------	Mar-Jun	+1-1.0	Apparent	Jan-Dec	>60	---	---	High------	High------	High.
Ne--------------- Newlang	A/D	Occasional	Brief-----	Mar-Jun	+1-1.0	Apparent	Oct-Jun	>60	---	---	Moderate	High------	High.
OrA-------------- Orion	C	Occasional	Brief-----	Mar-Nov	1.0-2.5	Apparent	Nov-May	>60	---	---	High------	High------	Low.

Table 19.--Soil and Water Features--Continued

Soil name and map symbol	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Bedrock: Depth	Bedrock: Hard-ness	Total subsi-dence	Potential frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft			In		In			
Pa-------------- Palms	A/D	Frequent----	Long------	Oct-Jun	+1-1.0	Apparent	Nov-May	>60	---	25-32	High-----	High-----	Moderate.
Pt. Pits													
Pu-------------- Ponycreek	A/D	None--------	---	---	+1-1.0	Apparent	Oct-Jun	>60	---	---	Moderate	High-----	High.
Pv:													
Ponycreek------	A/D	None--------	---	---	+1-1.0	Apparent	Oct-Jun	>60	---	---	Moderate	High-----	High.
Dawsil---------	A/D	None--------	---	---	+1-1.0	Apparent	Sep-Jun	>60	---	30-36	High-----	High-----	High.
Pw-------------- Psammaquents	D	Frequent----	Brief-----	Jan-Dec	+1-1.0	Apparent	Jan-Dec	>60	---	---	Moderate	Moderate	Moderate.
RkA------------- Rockdam	A	None--------	---	---	3.5-6.0	Apparent	Nov-May	>60	---	---	Low------	Low------	High.
RoA------------- Rowley	C	None--------	---	---	1.0-2.0	Apparent	Nov-May	>60	---	---	High-----	High-----	Moderate.
SeB, SeC2------- Seaton	B	None--------	---	---	>6.0	---	---	>60	---	---	High-----	Low------	Moderate.
SmB------------- Sebbo	B	None--------	---	---	3.5-6.0	Perched	Oct-May	>60	---	---	Moderate	Low------	Moderate.
SnA------------- Sechler	B	Occasional	Brief-----	Mar-Jun	1.0-2.0	Apparent	Oct-Jun	>60	---	---	High-----	High-----	High.
SoA------------- Sooner	B	None--------	---	---	1.0-2.0	Apparent	Nov-May	>60	---	---	High-----	Moderate	Moderate.
SpA------------- Sparta	A	None--------	---	---	>6.0	---	---	>60	---	---	Low------	Low------	Moderate.
TrB, TrC, TrF--- Tarr	A	None--------	---	---	>6.0	---	---	>60	---	---	Low------	Low------	High.
TtA------------- Tint	A	None--------	---	---	3.5-6.0	Apparent	Oct-Jun	>60	---	---	Low------	Low------	High.
TuB------------- Tintson	A	None--------	---	---	2.5-3.5	Perched	Oct-Jun	>60	---	---	Low------	Low------	High.
TwA------------- Toddville	B	None--------	---	---	3.5-6.0	Apparent	Nov-Apr	>60	---	---	High-----	Moderate	Moderate.

Table 19.--Soil and Water Features--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Total subsidence	Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness			Uncoated steel	Concrete
					Ft			In		In			
UdF------------- Udorthents	B	None---------	---	---	>6.0	---	---	>60	---	---	Moderate	Moderate	Moderate.
UfC2, UfD2------ Urne	B	None---------	---	---	>6.0	---	---	20-40	Soft	---	Moderate	Low------	Moderate.
UrF:													
Urne------------	B	None---------	---	---	>6.0	---	---	20-40	Soft	---	Moderate	Low------	Moderate.
Council---------	B	None---------	---	---	>6.0	---	---	>60	---	---	Moderate	Low------	Moderate.
Vs:													
Veedum----------	D	None---------	---	---	+1-1.0	Perched	Sep-Jun	20-40	Soft	---	High-----	High-----	High.
Elm Lake--------	A/D	None---------	---	---	+1-1.0	Perched	Oct-Jun	20-40	Soft	---	Moderate	High-----	High.
WmA------------- Whitehall	B	Rare---------	---	---	3.5-6.0	Apparent	Nov-Apr	>60	---	---	High-----	Moderate	High.

Table 20.--Engineering Index Test Data

(Dashes indicate that data were not available. LL means liquid limit; PI, plasticity index; UN, Unified; and NP, nonplastic)

Soil name and location	Parent material	Report number	Horizon	Depth	Percentage passing sieve*-- No. 4	No. 10	No. 40	No. 200	Percentage smaller than*-- 0.05 mm	0.02 mm	0.005 mm	0.002 mm	LL	PI	Classification AASHTO	UN
				In									Pct			
Council loam:	Loamy	S84WI-053-														
NE1/4SE1/4 sec.	colluvium.	3-1	Bt1, Bt2	7-22	100	100	88	57	53	35	18	13	22.6	4.6	A-4(4)	CL-ML
6, T. 19 N.,		3-2	C	38-60	100	100	84	38	33	20	10	7	---	NP	A-4(1)	SM
R. 6 W.																
Dunnville sandy	Loamy alluvium	S85WI-053-														
loam:	over sandy	1-1	Bw	16-24	100	100	70	37	36	28	15	11	25.7	8.5	A-4(0)	SC
SW1/4NW1/4 sec.	alluvium.	1-2	2C	27-60	100	100	79	1	1	1	1	1	---	NP	A-3(0)	SP
31, T. 20 N.,																
R. 4 W.																
Elevasil sandy	Loamy	S85WI-053-														
loam:	colluvium and	6-1	Bt2	19-26	100	100	90	53	50	39	19	14	21.9	5.7	A-4(4)	CL-ML
NE1/4NW1/4 sec.	siliceous															
2, T. 23 N.,	sandy															
R. 5 W.	residuum.															
Elm Lake muck:	Siliceous	S87WI-053-														
NE1/4SE1/4 sec.	sandy	4-1	Cg2	15-28	100	100	90	25	19	12	7	4	---	NP	A-2-4(0)	SM
14, T. 23 N.,	alluvium over	4-2	2Cg3	28-38	100	100	99	66	60	48	38	32	41.8	22.0	A-7-6(11)	CL
R. 4 W.	loamy															
	residuum.															
Seaton silt loam:	Loess---------	S84WI-053-														
SW1/4NW1/4 sec.		1-1	Bt1, Bt2	9-24	100	100	100	99	94	62	33	26	43.8	20.2	A-7-6(13)	CL
18, T. 19 N.,		1-2	C	42-60	100	100	100	98	92	55	28	23	37.2	13.7	A-6(9)	CL
R. 5 W.																
Seaton silt loam:	Loess---------	S84WI-053-														
NW1/4SW1/4 sec.		2-1	Bt1, Bt2	8-26	100	100	100	97	92	60	31	26	39.6	16.0	A-6(10)	CL
19, T. 19 N.,		2-2	C	36-60	100	100	100	99	93	57	28	22	38.0	14.4	A-6(10)	CL
R. 5 W.																
Tarr sand:	Siliceous	S90WI-053-														
NE1/4SW1/4 sec.	sandy	8-2	Bw1	4-9	100	100	66	7	7	7	5	4	---	NP	A-3(0)	SP-SM
24, T. 22 N.,	residuum	8-5	C	27-60	100	100	73	1	1	1	1	1	---	NP	A-3(0)	SP
R. 3 W.	derived from															
	sandstone.															

See footnote at end of table.

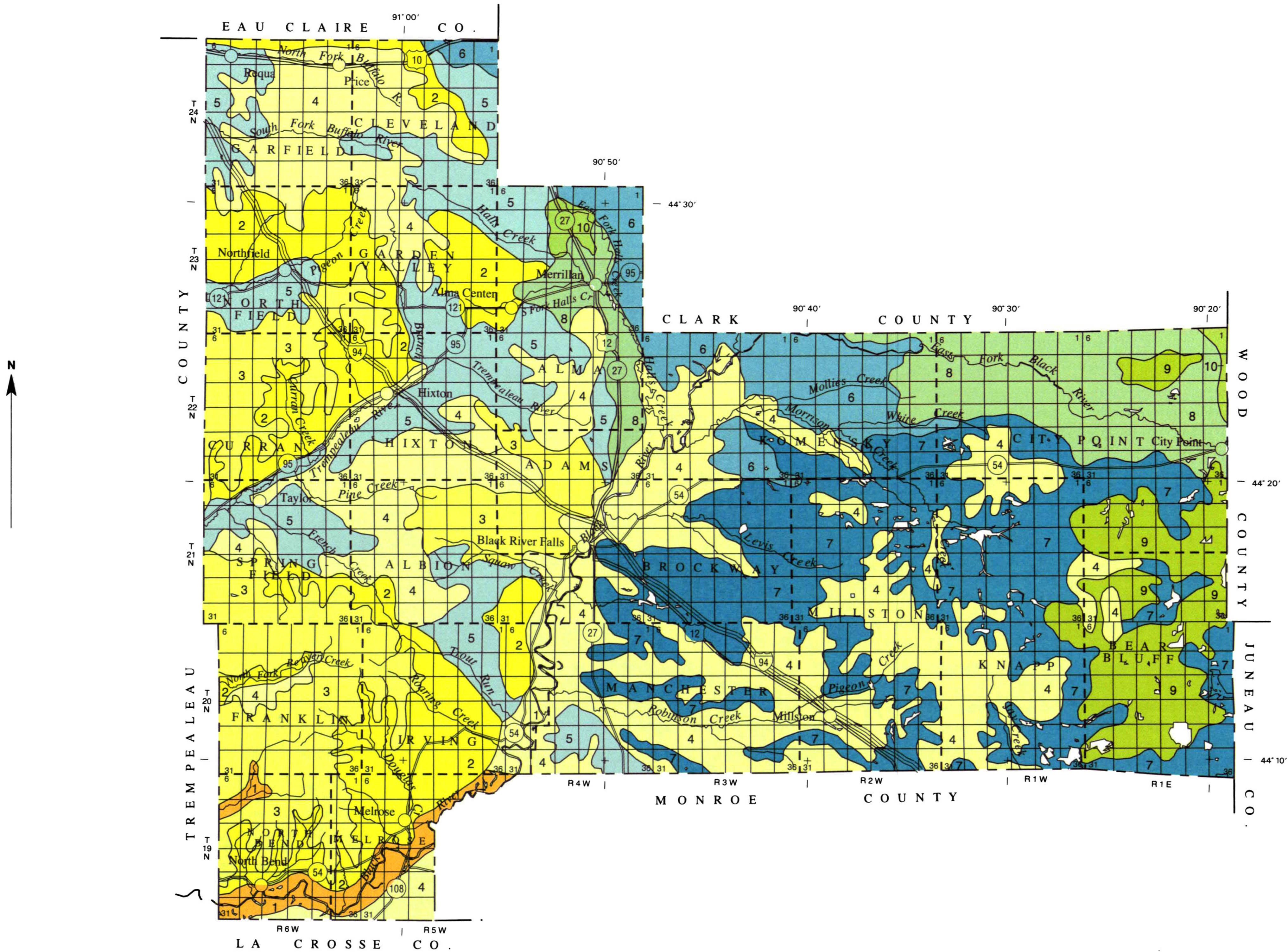
Table 20.--Engineering Index Test Data--Continued

Soil name and location	Parent material	Report number	Horizon	Depth	Percentage passing sieve*--: No. 4	No. 10	No. 40	No. 200	Percentage smaller than*--: 0.05 mm	0.02 mm	0.005 mm	0.002 mm	LL	PI	Classification: AASHTO	UN
				In									Pct			
Whitehall silt loam: NE1/4SE1/4 sec. 36, T. 20 N., R. 5 W.	Silty alluvium over siliceous sandy alluvium.	S85WI-053-3-1	Bt1, Bt2	11-26	100	100	97	83	78	54	29	23	38.5	12.9	A-6(9)	ML

* Mechanical analysis according to the AASHTO Designation T88-57 (AASHTO, 1986). Results from this procedure can differ somewhat from the results obtained by the soil survey procedure of the Natural Resources Conservation Service. In the AASHTO procedure, the fine material is analyzed by hydrometer method and the various grain-size fractions are calculated on the basis of all material up to and including that 3 inches in diameter. In the NRCS soil survey procedure, the fine material is analyzed by the pipette method and the material coarser than 2 millimeters in diameter is excluded from the calculation of grain-size fraction. The mechanical analysis data used in this table are not suitable for use in naming soil textural classes.

Table 21.--Classification of the Soils

Soil name	Family or higher taxonomic class
Absco	Sandy, siliceous, mesic Typic Udifluvents
Adder	Sandy or sandy-skeletal, siliceous, euic, mesic Terric Medisaprists
Arbutus	Sandy, siliceous, frigid Entic Haplorthods
Arenzville	Coarse-silty, mixed, nonacid, mesic Typic Udifluvents
Bertrand	Fine-silty, mixed, mesic Typic Hapludalfs
Bilmod	Coarse-loamy, siliceous, mesic Mollic Hapludalfs
Bilson	Coarse-loamy, siliceous, mesic Mollic Hapludalfs
Boone	Mesic, uncoated Typic Quartzipsamments
Citypoint	Dysic Typic Borosaprists
Coffton	Coarse-silty, mixed, mesic Fluvaquentic Hapludolls
Council	Coarse-loamy, mixed, mesic Typic Hapludalfs
Dawsil	Sandy or sandy-skeletal, siliceous, dysic Terric Borosaprists
Dunnville	Coarse-loamy, mixed Udic Haploborolls
Elevasil	Coarse-loamy, siliceous, mesic Ultic Hapludalfs
Elm Lake	Sandy over loamy, siliceous, acid, frigid Humaqueptic Epiaquents
Ettrick	Fine-silty, mixed, mesic Fluvaquentic Haplaquolls
Fairchild	Sandy over loamy, siliceous, frigid Ultic Epiaquods
Fordum	Coarse-loamy, mixed, nonacid, frigid Mollic Fluvaquents
Gale	Fine-silty over sandy or sandy-skeletal, mixed, mesic Typic Hapludalfs
Gardenvale	Fine-loamy over sandy or sandy-skeletal, siliceous, mesic Mollic Hapludalfs
Gosil	Mesic, coated Typic Quartzipsamments
Hiles	Fine-loamy, mixed Typic Glossoboralfs
Hixton	Fine-loamy over sandy or sandy-skeletal, mixed, mesic Typic Hapludalfs
Hoop	Coarse-loamy, siliceous, mesic Aquic Argiudolls
Houghton	Euic, mesic Typic Medisaprists
Humbird	Coarse-loamy over clayey, mixed, frigid Alfic Haplorthods
Impact	Sandy, siliceous, mesic Quartzipsammentic Haplumbrepts
Ironrun	Sandy, siliceous, frigid Aquic Haplorthods
Jackson	Fine-silty, mixed, mesic Typic Hapludalfs
Kalmarville	Coarse-loamy, mixed, nonacid, mesic Mollic Fluvaquents
Kert	Fine-loamy, mixed Aquic Glossoboralfs
La Farge	Fine-silty, mixed, mesic Typic Hapludalfs
Loxley	Dysic Typic Borosaprists
Ludington	Sandy over loamy, siliceous, frigid Oxyaquic Haplorthods
Mahtomedi	Mixed, frigid Typic Udipsamments
Majik	Mesic, coated Aquic Quartzipsamments
Merimod	Fine-loamy over sandy or sandy-skeletal, mixed, mesic Mollic Hapludalfs
Merit	Fine-loamy over sandy or sandy-skeletal, mixed, mesic Mollic Hapludalfs
Merrillan	Coarse-loamy over clayey, mixed, frigid Aqualfic Haplorthods
Moppet	Coarse-loamy, mixed, frigid Oxyaquic Dystrochrepts
Newlang	Siliceous, mesic Humaqueptic Psammaquents
Northbend	Coarse-loamy over sandy or sandy-skeletal, mixed, mesic Fluvaquentic Dystrochrepts
Orion	Coarse-silty, mixed, nonacid, mesic Aquic Udifluvents
Palms	Loamy, mixed, euic, mesic Terric Medisaprists
Ponycreek	Siliceous, frigid Humaqueptic Psammaquents
Psammaquents	Psammaquents
Rockdam	Frigid, coated Typic Quartzipsamments
Rowley	Fine-silty, mixed, mesic Aquic Argiudolls
Seaton	Fine-silty, mixed, mesic Typic Hapludalfs
Sebbo	Fine-loamy, mixed, mesic Mollic Hapludalfs
Sechler	Coarse-loamy, siliceous, mesic Aquic Haplumbrepts
Silverhill	Coarse-loamy, siliceous, mesic Ultic Hapludalfs
Sooner	Fine-loamy over sandy or sandy-skeletal, mixed, mesic Aquollic Hapludalfs
Sparta	Sandy, mixed, mesic Entic Hapludolls
Tarr	Mesic, uncoated Typic Quartzipsamments
Tint	Mesic, uncoated Typic Quartzipsamments
Tintson	Mesic, uncoated Oxyaquic Quartzipsamments
Toddville	Fine-silty, mixed, mesic Typic Argiudolls
Udorthents	Udorthents
Urne	Coarse-loamy, mixed, mesic Dystric Eutrochrepts
Veedum	Fine-loamy over sandy or sandy-skeletal, mixed, acid, frigid Typic Humaquepts
Whitehall	Fine-silty over sandy or sandy-skeletal, mixed, mesic Typic Argiudolls



SOIL LEGEND*

1	Absco-Northbend-Kalmarville association
2	Seaton-Council association
3	Urne-Council-La Farge association
4	Tarr-Boone-Rockdam association
5	Bilson-Elevasil-Merit association
6	Elm Lake-Fairchild association
7	Ironrun-Ponycreek-Dawsil association
8	Merrillan-Veedum-Humbird association
9	Loxley-Dawsil association
10	Kert-Veedum association

*The units on this legend are described in the text under the heading "General Soil Map Units."

Compiled 1992

SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
RESEARCH DIVISION OF THE COLLEGE OF AGRICULTURAL AND LIFE SCIENCES
UNIVERSITY OF WISCONSIN

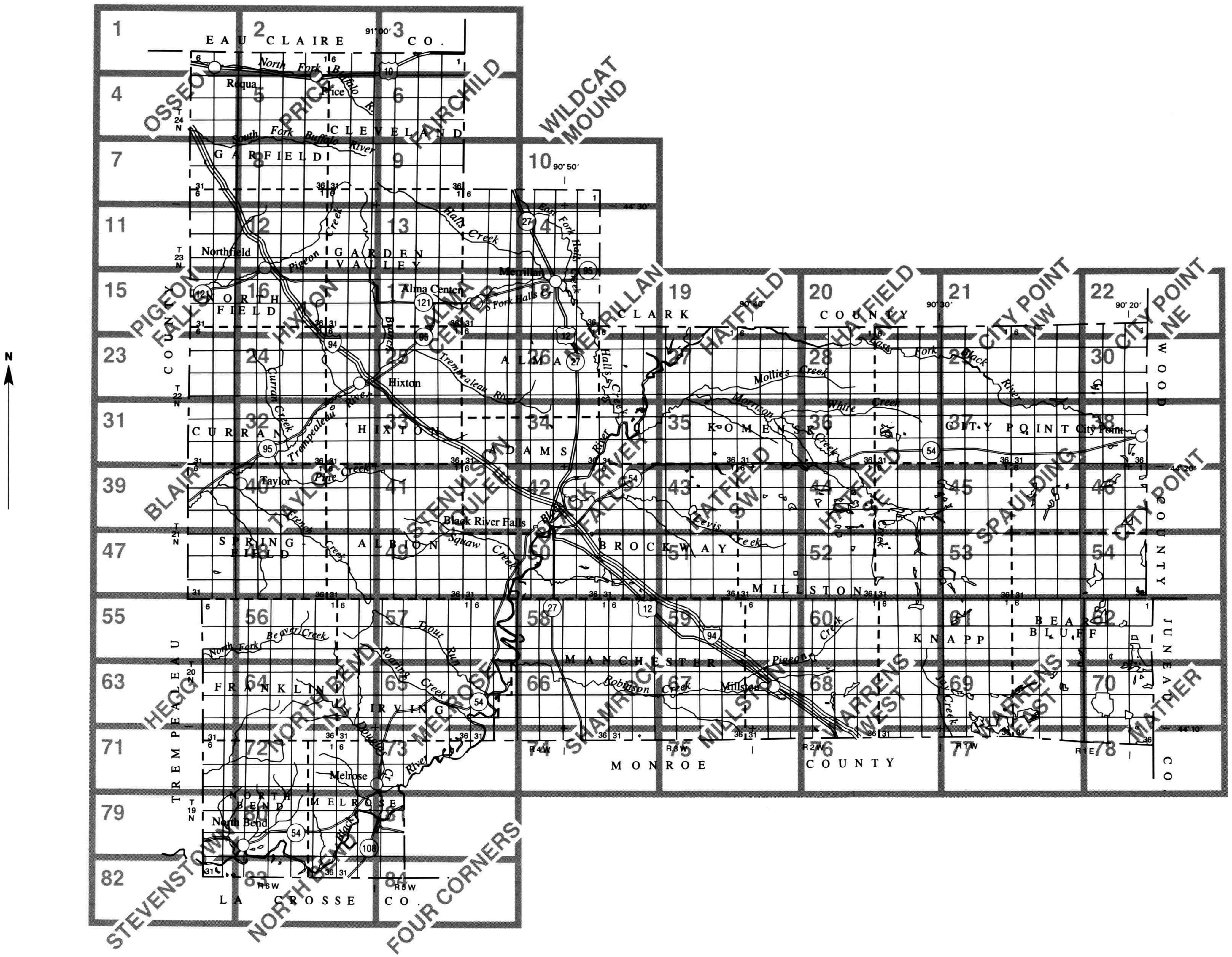
GENERAL SOIL MAP
JACKSON COUNTY, WISCONSIN

Scale 1:316800

1 0 1 2 3
MILES

1 0 1 2 3 4 5 6
KILOMETERS

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.



SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

INDEX TO MAP SHEETS
JACKSON COUNTY, WISCONSIN

Scale 1:316800

1 0 1 2 3
MILES

1 0 1 2 3 4 5 6
KILOMETERS

SOIL LEGEND

Map symbols consist of a combination of uppercase and lowercase letters. The first letter in the map symbol is the initial letter of the map unit name. The second letter is lowercase and separates map units having names that begin with the same letter, except that it does not separate slope phases. Some map symbols have a third letter, which is uppercase and indicates the class of slope. Map symbols without a third letter are for nearly level soils or miscellaneous areas. Map symbols that have a number 2 following the uppercase letter for slope class are for moderately eroded soils. Map symbols without a number are for uneroded or slightly eroded soils.

SYMBOL	NAME
AbA	Absco loamy sand, 0 to 3 percent slopes
AcA	Absco-Northbend complex, 0 to 3 percent slopes
Ad	Adder muck, 0 to 1 percent slopes
ArA	Arenzville silt loam, 0 to 3 percent slopes
BeB	Bertrand silt loam, 1 to 6 percent slopes
BkA	Bilmod sandy loam, 0 to 3 percent slopes
BlB	Bilson sandy loam, 0 to 6 percent slopes
BnB	Bilson-Silverhill sandy loams, 1 to 6 percent slopes
BnC2	Bilson-Elevasil sandy loams, 6 to 12 percent slopes, eroded
BnD2	Bilson-Elevasil sandy loams, 12 to 20 percent slopes, eroded
BoB	Boone sand, 2 to 6 percent slopes
BoC	Boone sand, 6 to 15 percent slopes
BoF	Boone sand, 15 to 50 percent slopes
BpF	Boone-Elevasil complex, 15 to 50 percent slopes
Cd	Citypoint mucky peat, 0 to 1 percent slopes
CfA	Coffton silt loam, 0 to 3 percent slopes
CoC2	Council loam, 6 to 12 percent slopes, eroded
CpC2	Council-Bilson fine sandy loams, 6 to 12 percent slopes, eroded
CpD2	Council-Bilson fine sandy loams, 12 to 20 percent slopes, eroded
CsD2	Council and Seaton soils, 12 to 20 percent slopes, eroded
CsE	Council and Seaton soils, 20 to 30 percent slopes
Da	Dawsil mucky peat, 0 to 1 percent slopes
DuA	Dunnville sandy loam, 0 to 3 percent slopes
ElB	Elevasil sandy loam, 2 to 6 percent slopes
ElC2	Elevasil sandy loam, 6 to 12 percent slopes, eroded
ElD2	Elevasil sandy loam, 12 to 20 percent slopes, eroded
Eo	Elm Lake mucky sand, 0 to 2 percent slopes
Et	Ettrick silt loam, 0 to 2 percent slopes
FaA	Fairchild sand, 0 to 3 percent slopes
FeA	Fairchild-Elm Lake complex, 0 to 3 percent slopes
GaC2	Gale silt loam, 6 to 12 percent slopes, eroded
GaD2	Gale silt loam, 12 to 25 percent slopes, eroded
GoB	Gosil loamy sand, 0 to 6 percent slopes
GoC	Gosil loamy sand, 6 to 12 percent slopes
HkB	Hiles-Kert silt loams, 0 to 6 percent slopes
HnB	Hixton loam, 2 to 6 percent slopes
HnC2	Hixton loam, 6 to 12 percent slopes, eroded
HnD2	Hixton loam, 12 to 20 percent slopes, eroded
HpA	Hoop sandy loam, 0 to 3 percent slopes
Ht	Houghton muck, 0 to 1 percent slopes
HuB	Humbird fine sandy loam, 1 to 6 percent slopes
HxB	Humbird-Merrillan fine sandy loams, 0 to 6 percent slopes
ImA	Impact sand, 0 to 3 percent slopes
IrA	Ironrun sand, 0 to 3 percent slopes
IxA	Ironrun-Ponycreek complex, 0 to 3 percent slopes
IzB	Ironrun-Ponycreek-Arbutus complex, 0 to 6 percent slopes
JaA	Jackson silt loam, 0 to 2 percent slopes
JaB	Jackson silt loam, 2 to 6 percent slopes
Ka	Kalmarville silt loam, 0 to 1 percent slopes
KeA	Kert silt loam, 0 to 3 percent slopes
LfC2	La Farge silt loam, 4 to 12 percent slopes, eroded
LfD2	La Farge silt loam, 12 to 25 percent slopes, eroded
LsD2	La Farge-Seaton silt loams, 12 to 25 percent slopes, eroded
Lt	Loxley peat, 0 to 1 percent slopes
LuB	Ludington sand, 1 to 6 percent slopes
LxB	Ludington-Fairchild sands, 0 to 6 percent slopes
MaB	Mahtomedi loamy sand, 0 to 6 percent slopes
MbA	Majik loamy fine sand, 0 to 3 percent slopes
MmA	Merimod silt loam, 0 to 3 percent slopes
MnB	Merit silt loam, 0 to 6 percent slopes
MoB	Merit-Gardenvale silt loams, 1 to 6 percent slopes
MpA	Merrillan fine sandy loam, 0 to 3 percent slopes
MrA	Merrillan-Veedum complex, 0 to 3 percent slopes
MxA	Moppet-Fordum complex, 0 to 3 percent slopes
Ne	Newlang muck, 0 to 2 percent slopes
OrA	Orion silt loam, 0 to 3 percent slopes
Pa	Palms muck, 0 to 1 percent slopes
Pt	Pits
Pu	Ponycreek muck, 0 to 2 percent slopes
Pv	Ponycreek-Dawsil complex, 0 to 2 percent slopes
Pw	Psammaquents, nearly level
RkA	Rockdam sand, 0 to 3 percent slopes
RoA	Rowley silt loam, 0 to 3 percent slopes
SeB	Seaton silt loam, 2 to 6 percent slopes
SeC2	Seaton silt loam, 6 to 12 percent slopes, eroded
SmB	Sebbo loam, 1 to 6 percent slopes
SnA	Sechler loam, 0 to 3 percent slopes
SoA	Sooner silt loam, 0 to 3 percent slopes
SpA	Sparta sand, 0 to 3 percent slopes
TrB	Tarr sand, 0 to 6 percent slopes
TrC	Tarr sand, 6 to 15 percent slopes
TrF	Tarr sand, 15 to 45 percent slopes
TtA	Tint sand, 0 to 3 percent slopes
TuB	Tintson sand, 0 to 6 percent slopes
TwA	Toddville silt loam, 0 to 3 percent slopes
UdF	Udorthents, loamy, very steep
UfC2	Urne fine sandy loam, 6 to 12 percent slopes, eroded
UfD2	Urne fine sandy loam, 12 to 25 percent slopes, eroded
UrF	Urne-Council complex, 25 to 50 percent slopes
Vs	Veedum-Elm Lake mucks, 0 to 2 percent slopes
WmA	Whitehall silt loam, 0 to 3 percent slopes
w	Water

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- County or parish
- Reservation (national forest or park, state forest or park, and large airport)
- Field sheet matchline and neatline

AD HOC BOUNDARY (label)

- Small airport, airfield, park, oilfield, cemetery, or flood pool

STATE COORDINATE TICK
1 890 000 FEET

LAND DIVISION CORNER (sections and land grants)

ROADS

- Divided (median shown if scale permits)
- Other roads

ROAD EMBLEM & DESIGNATIONS

- Interstate
- Federal
- State
- County, farm or ranch

RAILROAD

DAMS

- Medium or Small (Named where applicable)

PITS

- Gravel pit (< 4 acres)

MISCELLANEOUS CULTURAL FEATURES

- Farmstead, house (omit in urban area) (occupied)
- Church
- School

WATER FEATURES

DRAINAGE

- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end
- Canals or ditches
  - Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

- Perennial

MISCELLANEOUS WATER FEATURES

- Wet spot (< 4 acres)

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS — AbA GoB

ESCARPMENTS

- Bedrock (points down slope) (< 4 acres)

SHORT STEEP SLOPE

GULLY (< 4 acres)

MISCELLANEOUS

- Blowout (< 4 acres)
- Rock outcrop (< 4 acres)
- Sandy spot (< 4 acres)
- Sanitary landfill (< 4 acres)
- Cut or fill area (< 4 acres)
- Shallow to bedrock (< 4 acres)
- Silty spot (< 4 acres)

1

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photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

1 MILE
1 KILOMETER
SCALE 1:20 000
0
1/4
1/2
3/4
1
0
0.5
1

SOIL SURVEY OF JACKSON COUNTY, WISCONSIN — SHEET NUMBER 2

N

1 MILE
1 KILOMETER
SCALE 1:20 000
0
1/4
1/2
3/4
1
0
0.5
1

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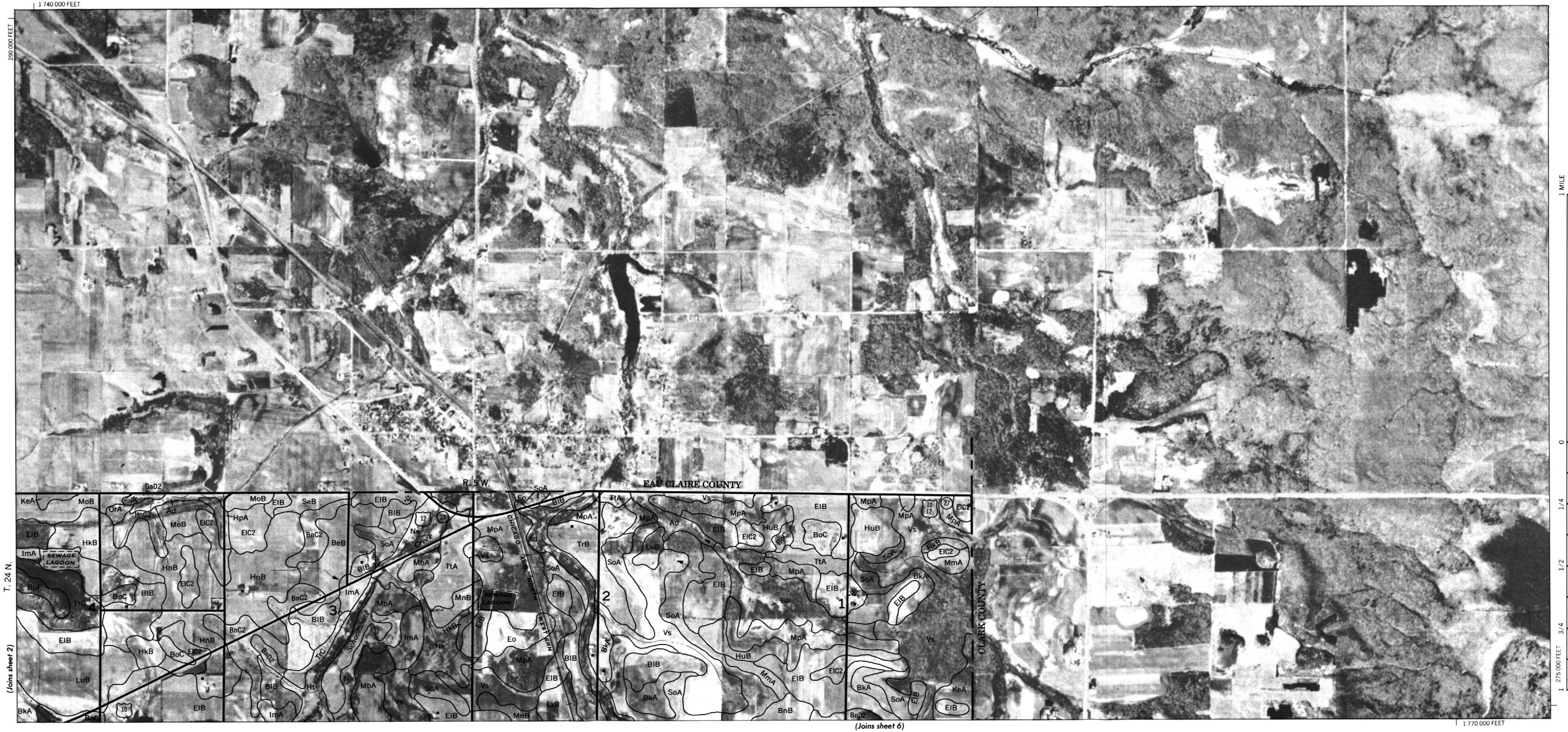

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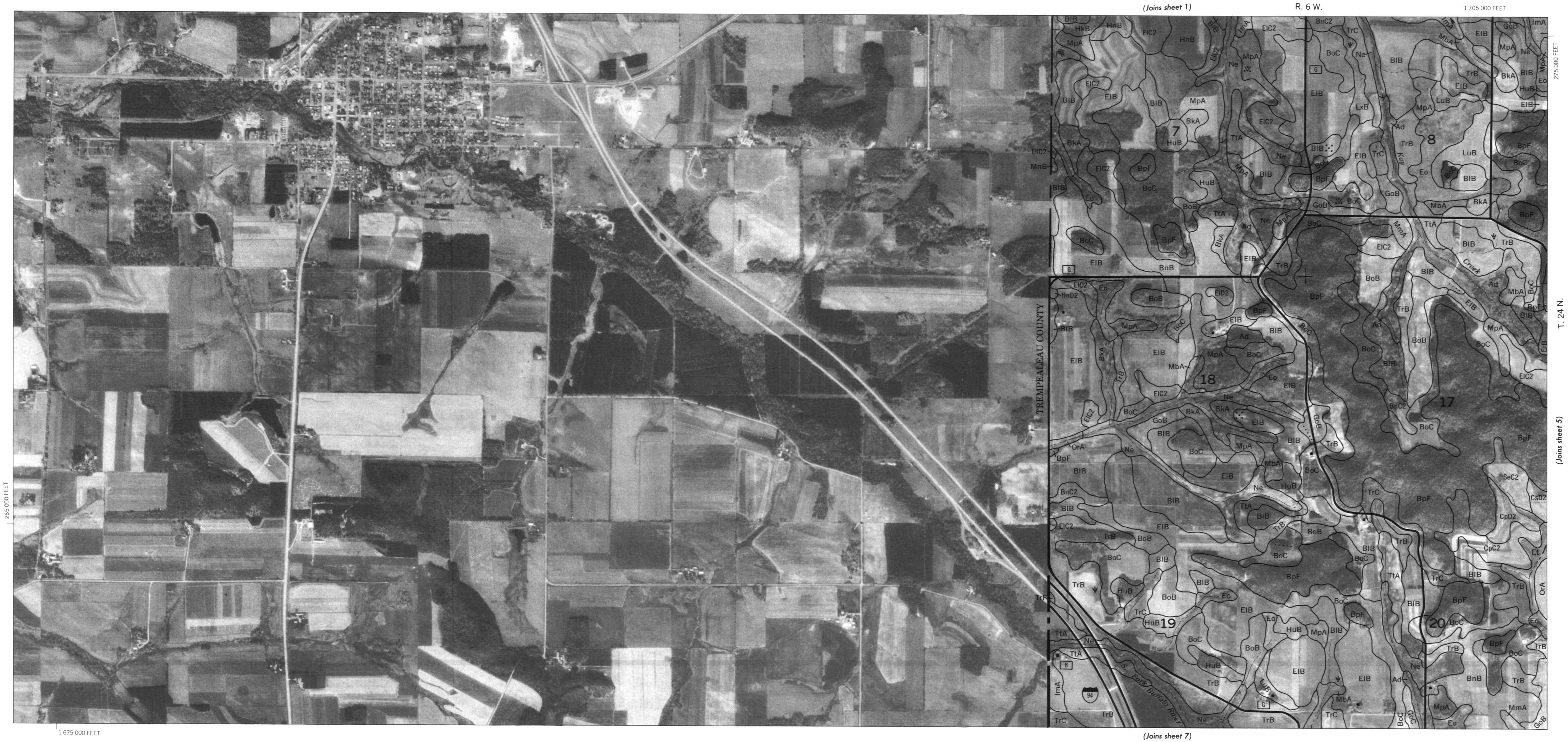
SOIL SURVEY OF JACKSON COUNTY, WISCONSIN — SHEET NUMBER 4

N

1 MILE
1 KILOMETER
SCALE 1:20 000
0
1/4
1/2
3/4
1
0
0.5
1



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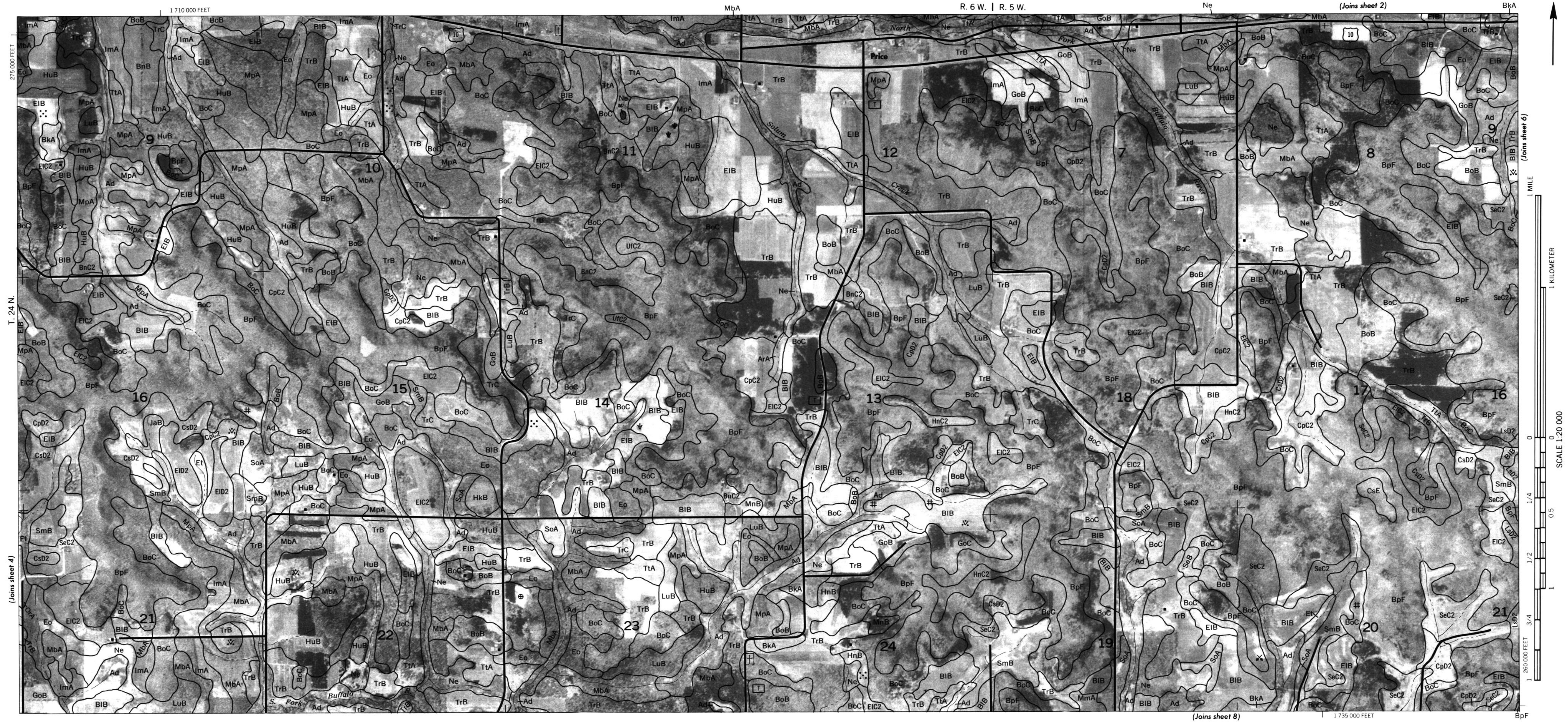
5



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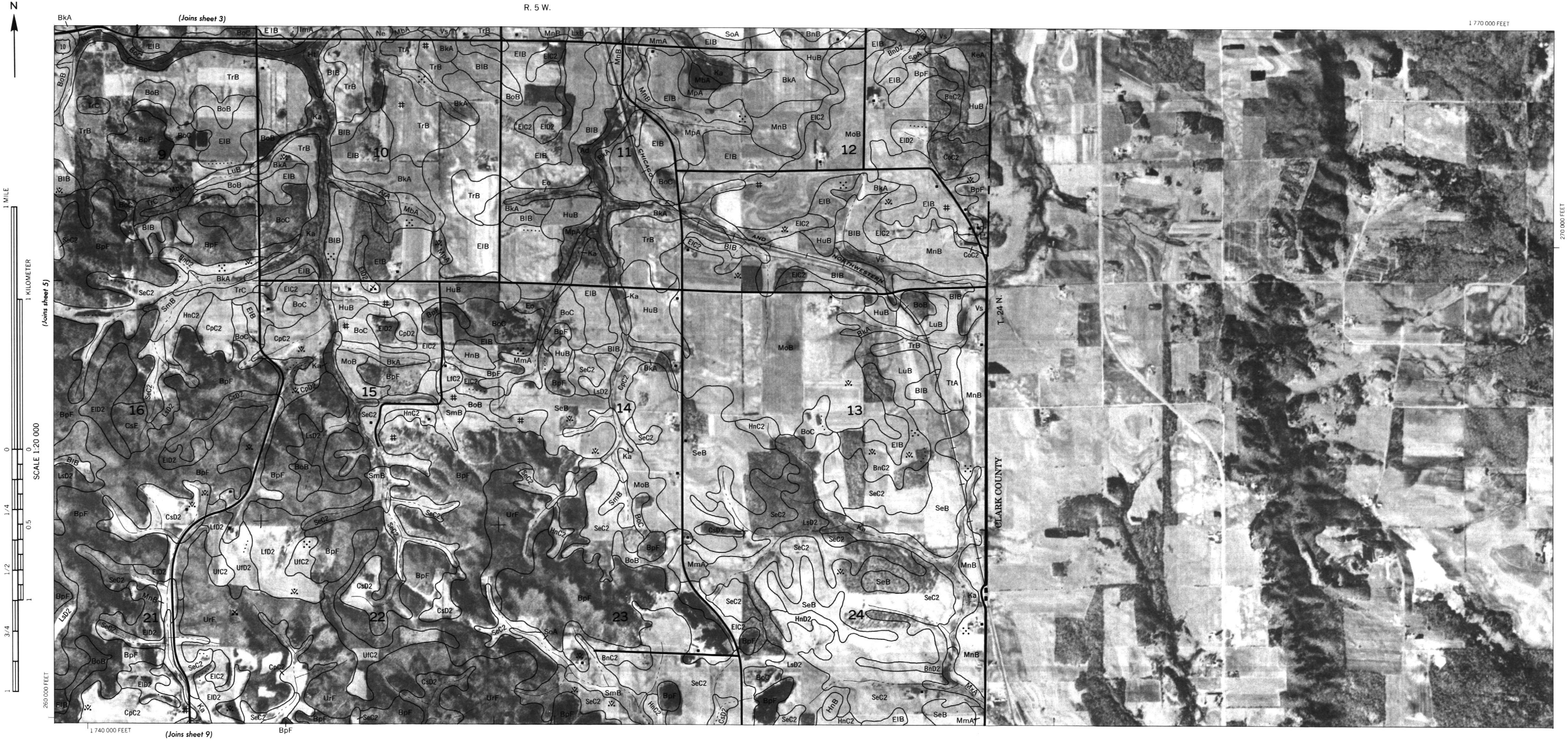
SOIL SURVEY OF JACKSON COUNTY, WISCONSIN — SHEET NUMBER 6



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SOIL SURVEY OF JACKSON COUNTY, WISCONSIN — SHEET NUMBER 7

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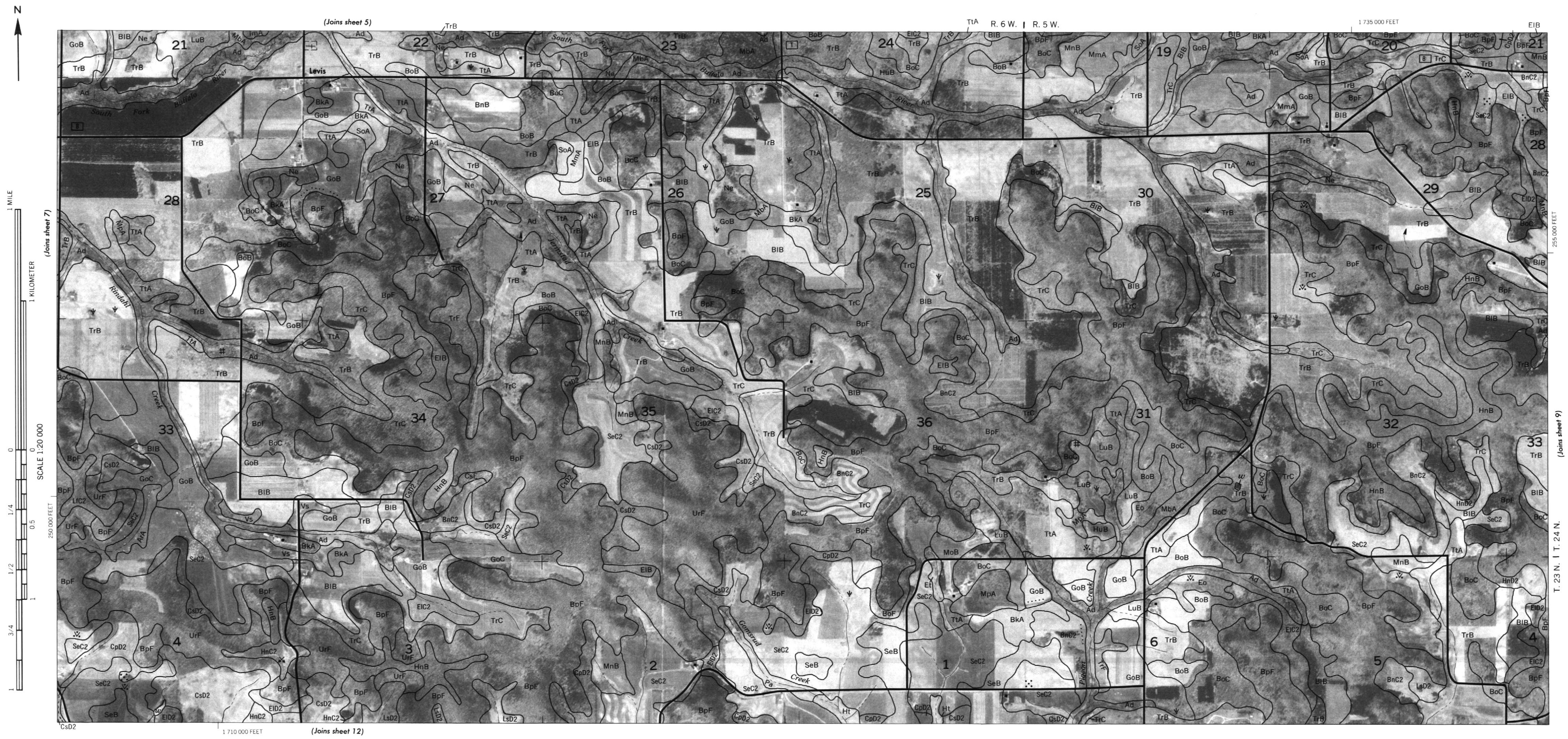
SOIL SURVEY OF JACKSON COUNTY, WISCONSIN — SHEET NUMBER 8



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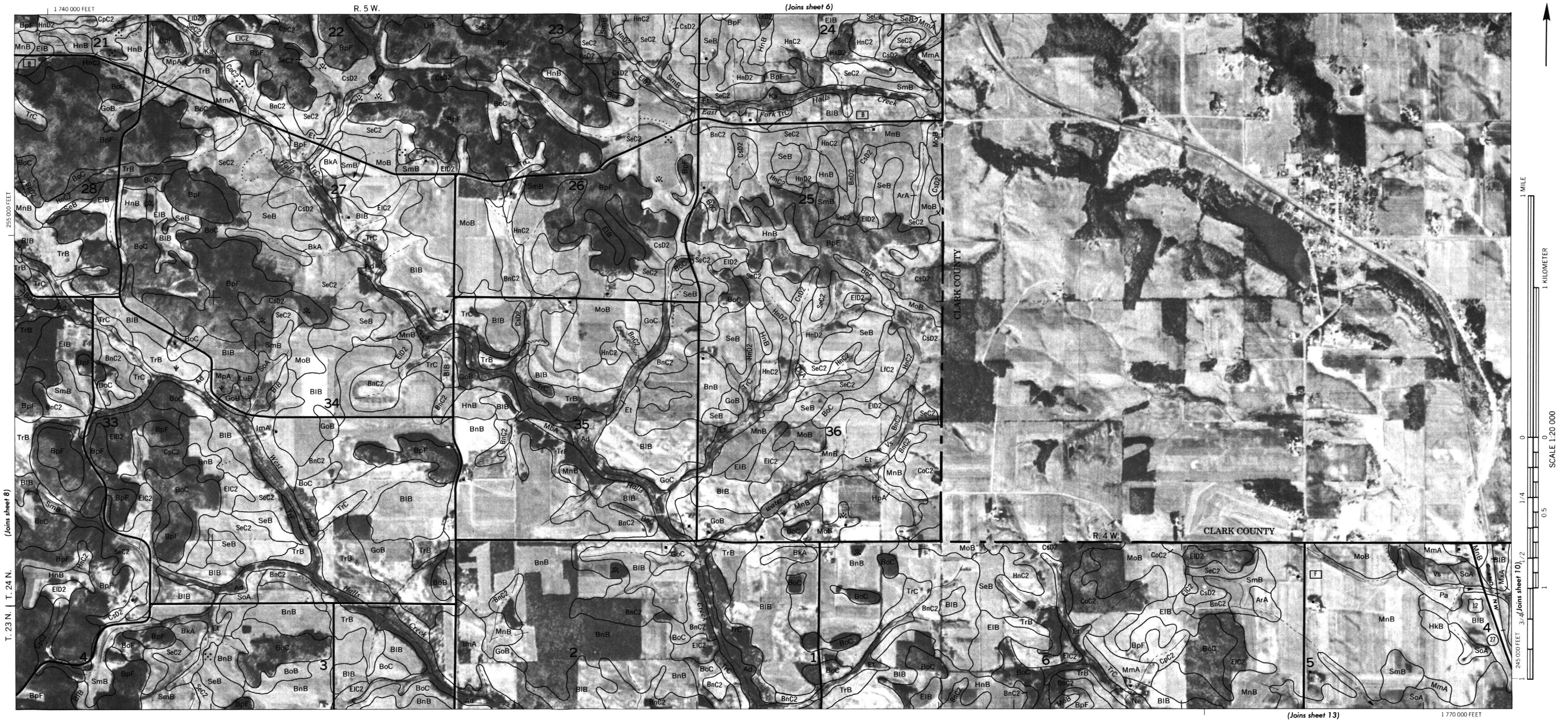
9



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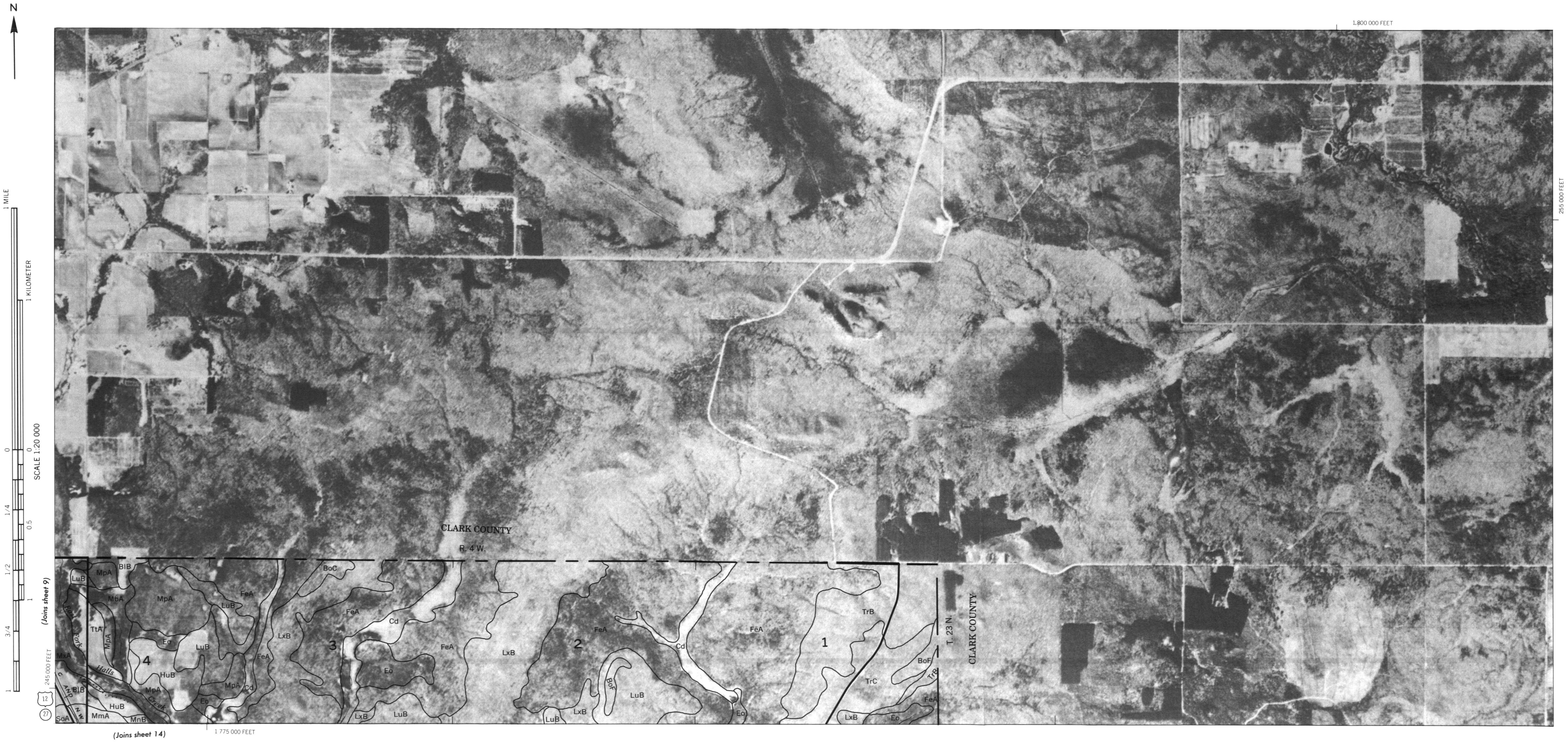
SOIL SURVEY OF JACKSON COUNTY, WISCONSIN — SHEET NUMBER 10



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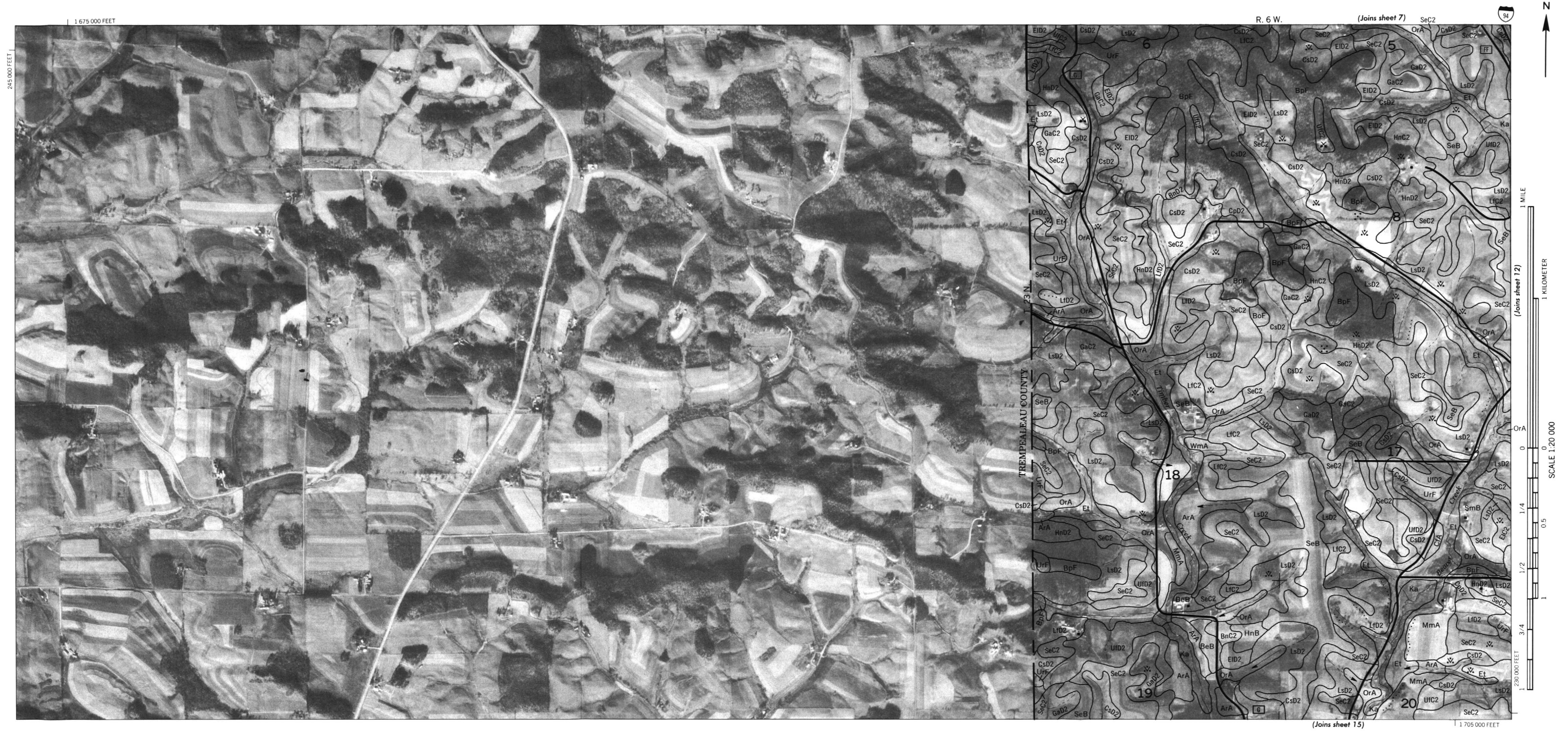

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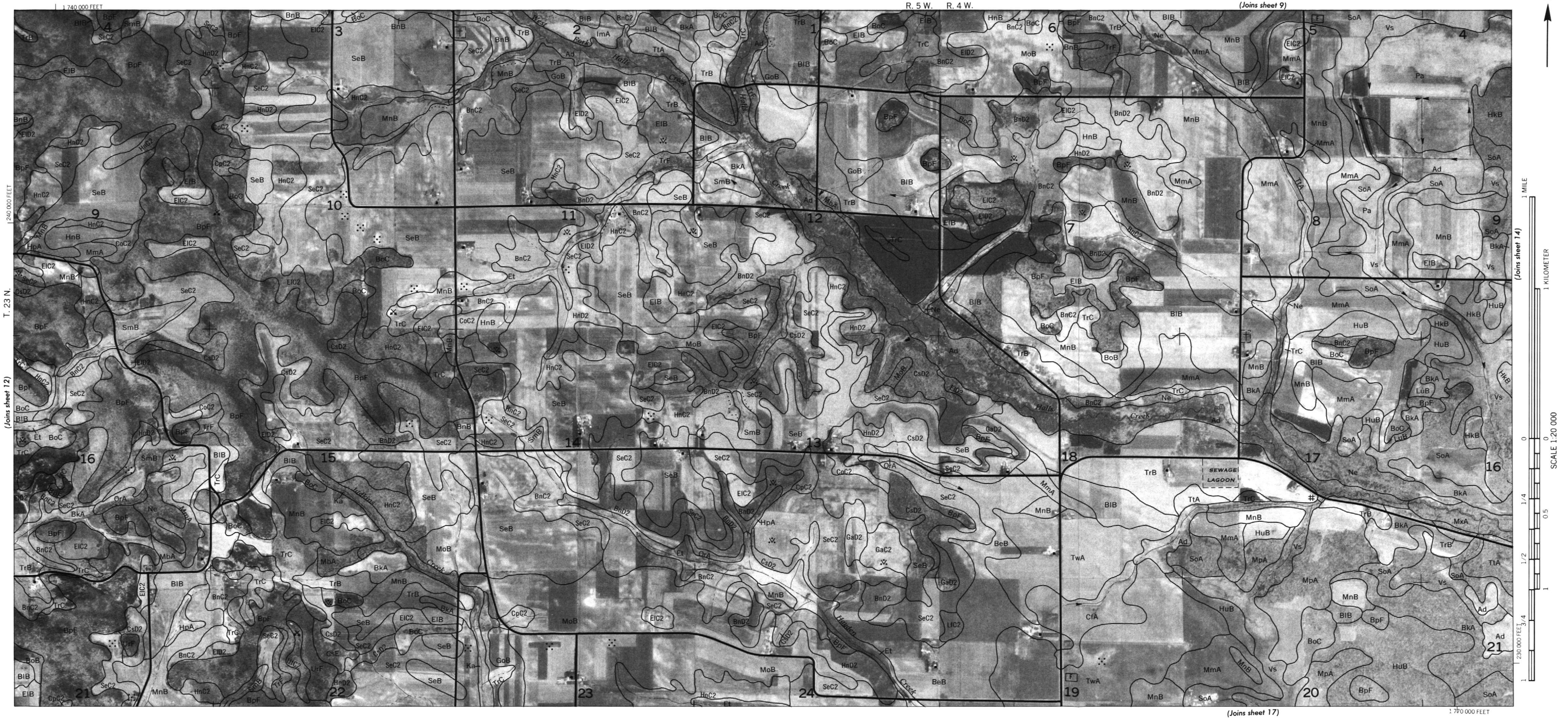

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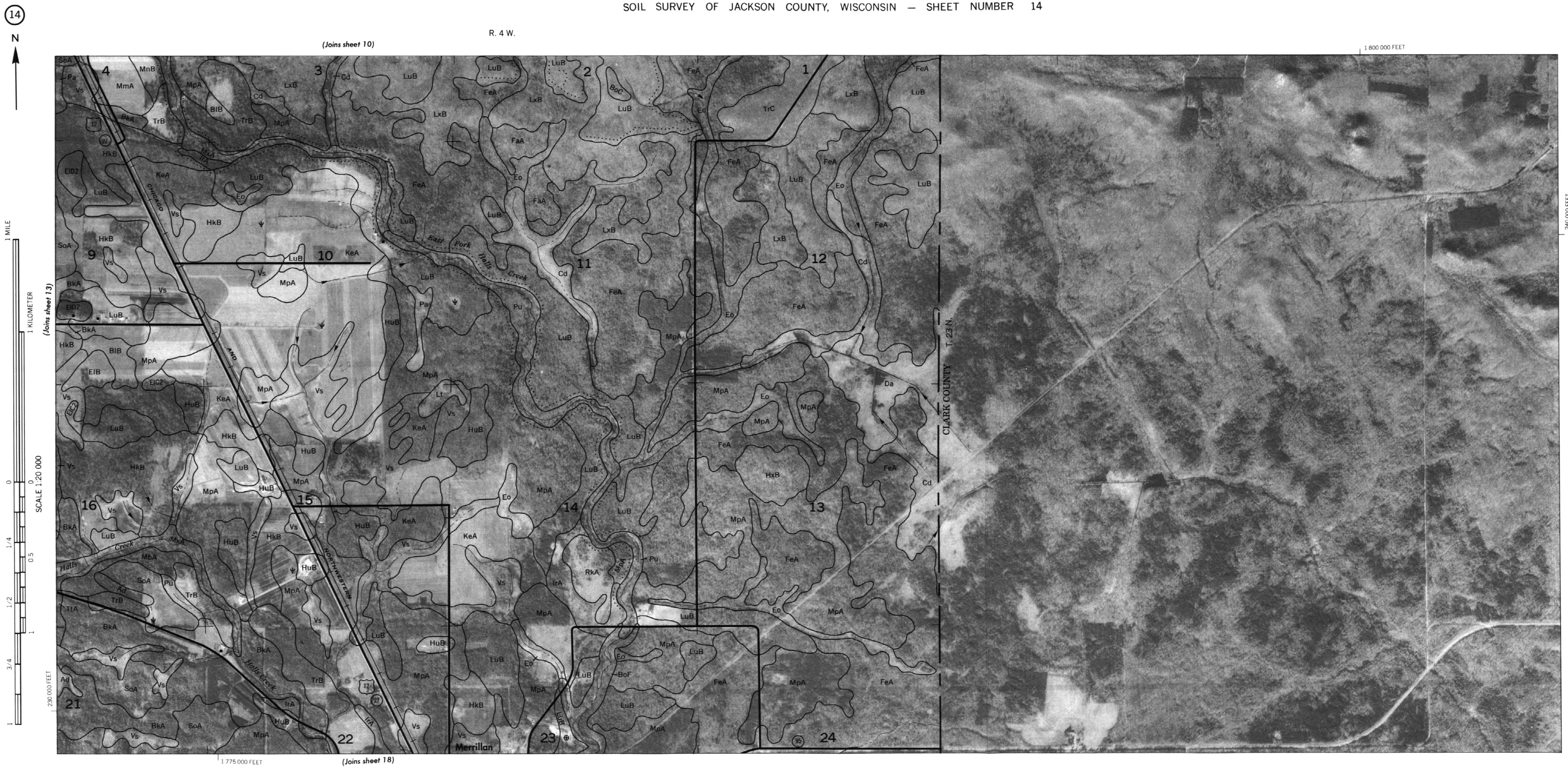

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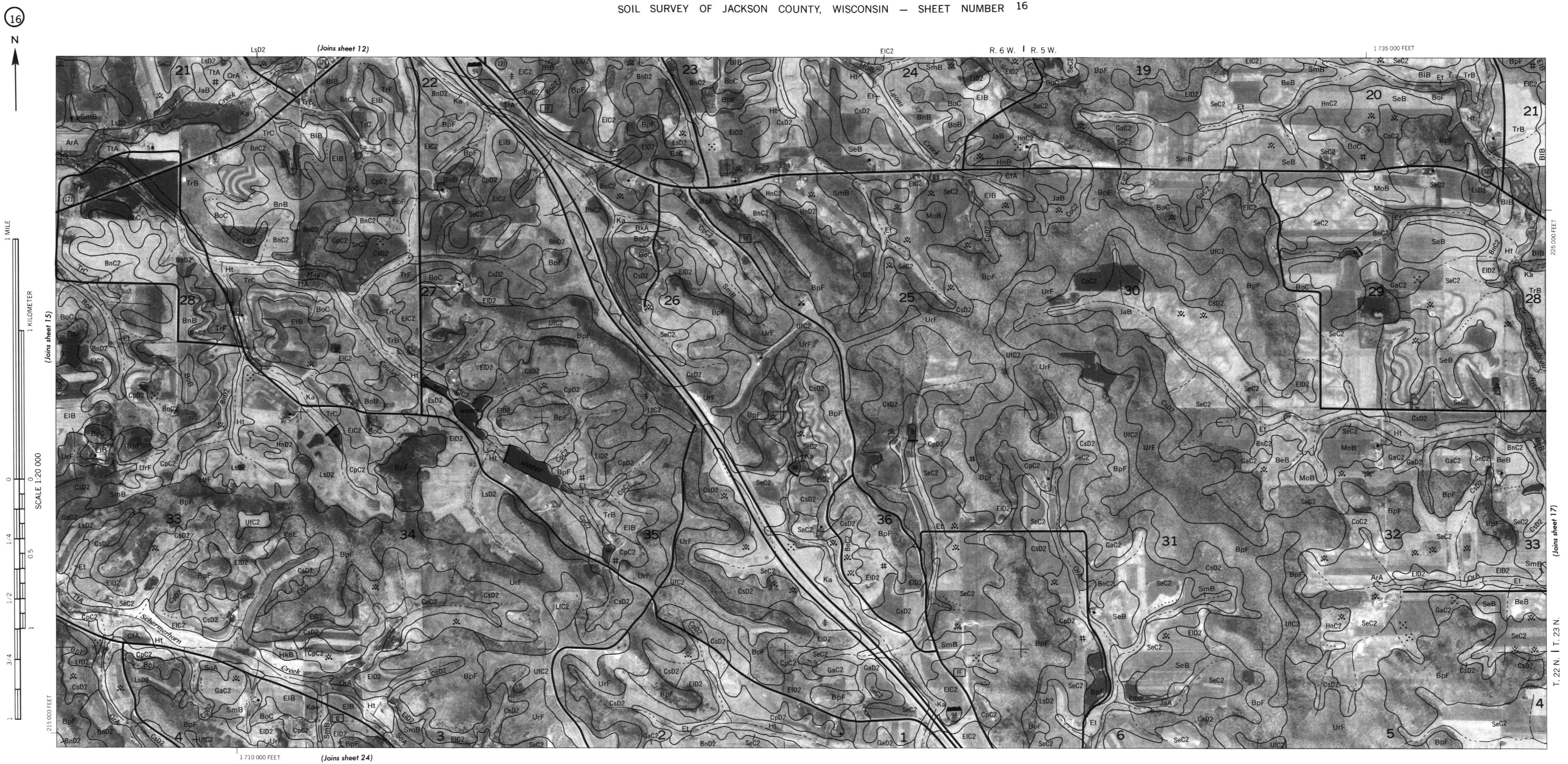

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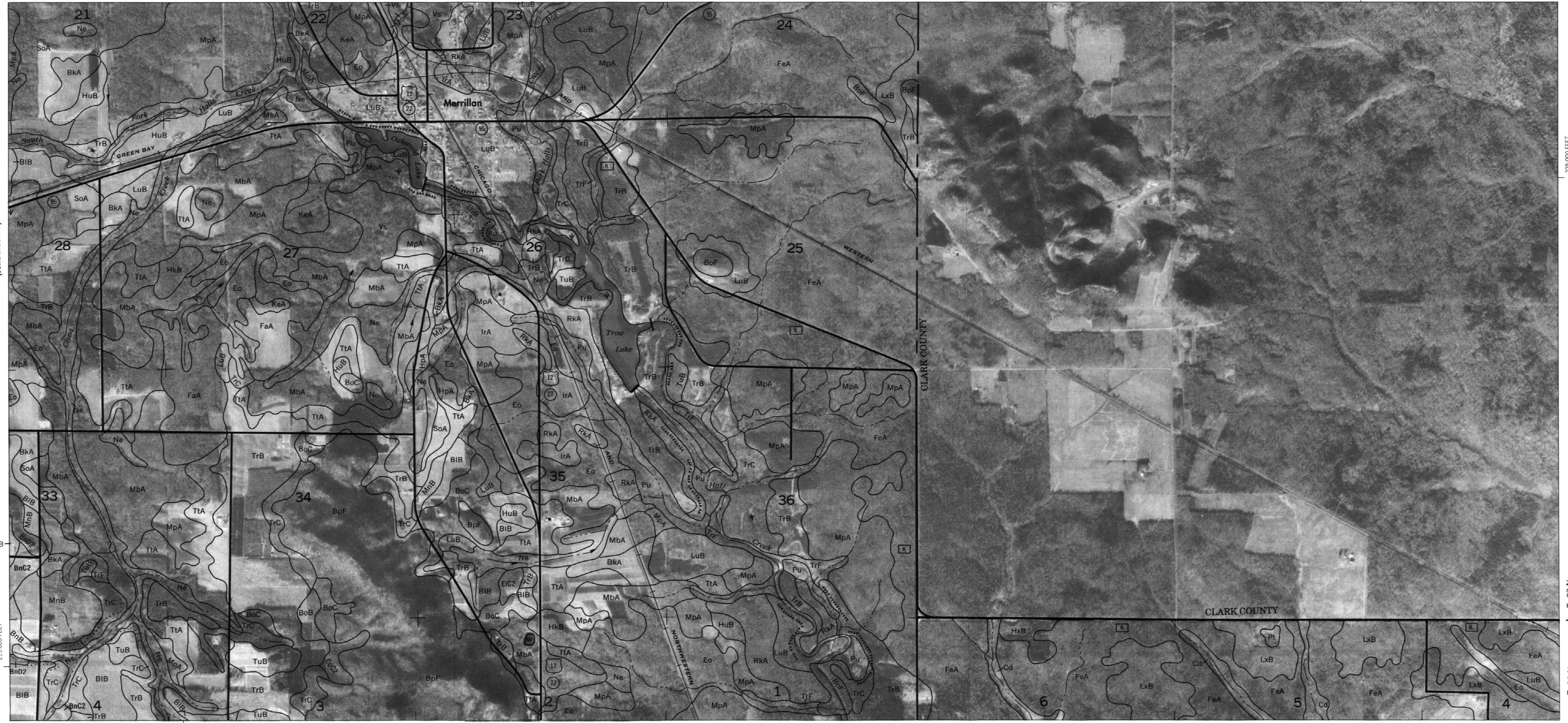
SOIL SURVEY OF JACKSON COUNTY, WISCONSIN — SHEET NUMBER 18

N

(Joins sheet 14)

R. 4 W. | R. 3 W.

1 800 000 FEET



1 MILE

1 KILOMETER

(Joins sheet 17)

SCALE 1:20 000

225 000 FEET

215 000 FEET

1 775 000 FEET

(Joins sheet 26)

T. 23 N.

T. 22 N.

(Joins sheet 19)

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N

SCALE 1:20 000
0 1/4 1/2 3/4 1 MILE
0 0.5 1 KILOMETER

SOIL SURVEY OF JACKSON COUNTY, WISCONSIN — SHEET NUMBER 20

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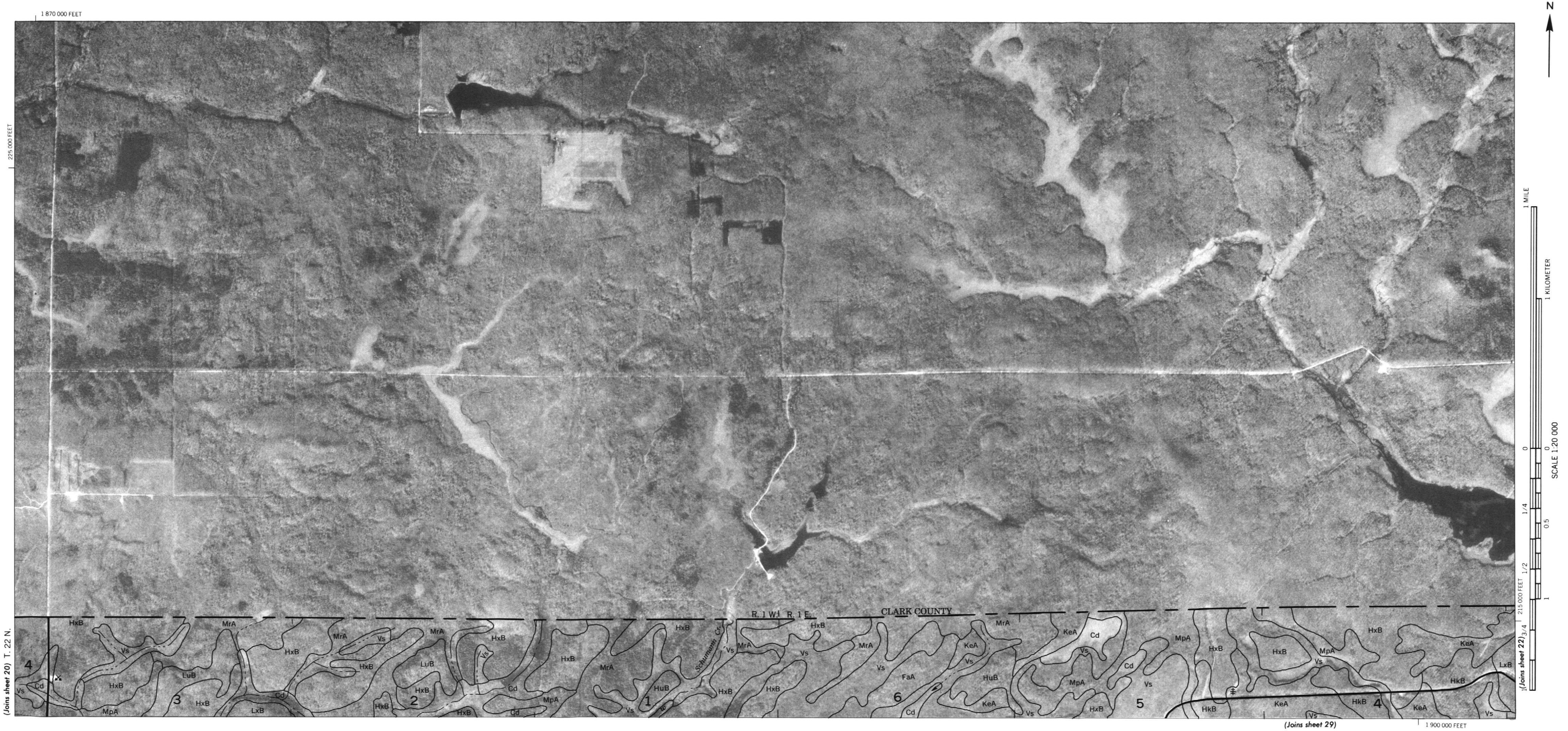

SOIL SURVEY OF JACKSON COUNTY, WISCONSIN — SHEET NUMBER 22

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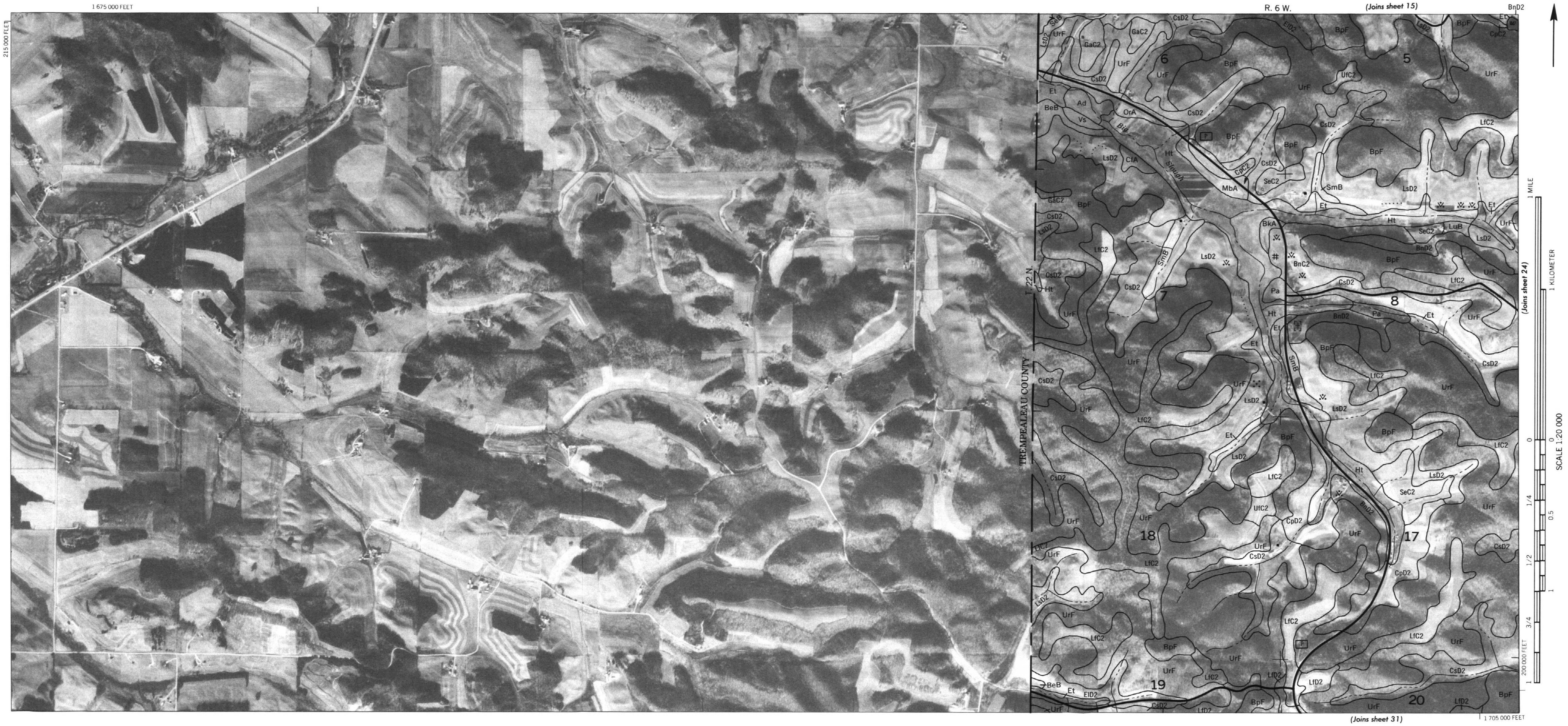

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SOIL SURVEY OF JACKSON COUNTY, WISCONSIN — SHEET NUMBER 24

N

(Joins sheet 16)

R. 6 W. | R. 5 W.

1 735 000 FEET

1 MILE
1 KILOMETER
SCALE 1:20 000
0 1/4 1/2 3/4 1
0 0.5 1

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey from 1976-1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

1 740 000 FEET R. 5 W. R. 4 W. (Joins sheet 17)

(Joins sheet 24) T. 22 N. 210 000 FEET

(Joins sheet 26) 200 000 FEET

TrB (Joins sheet 33) 1 770 000 FEET

1 MILE 1 KILOMETER SCALE 1:20 000

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey from 1976-1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

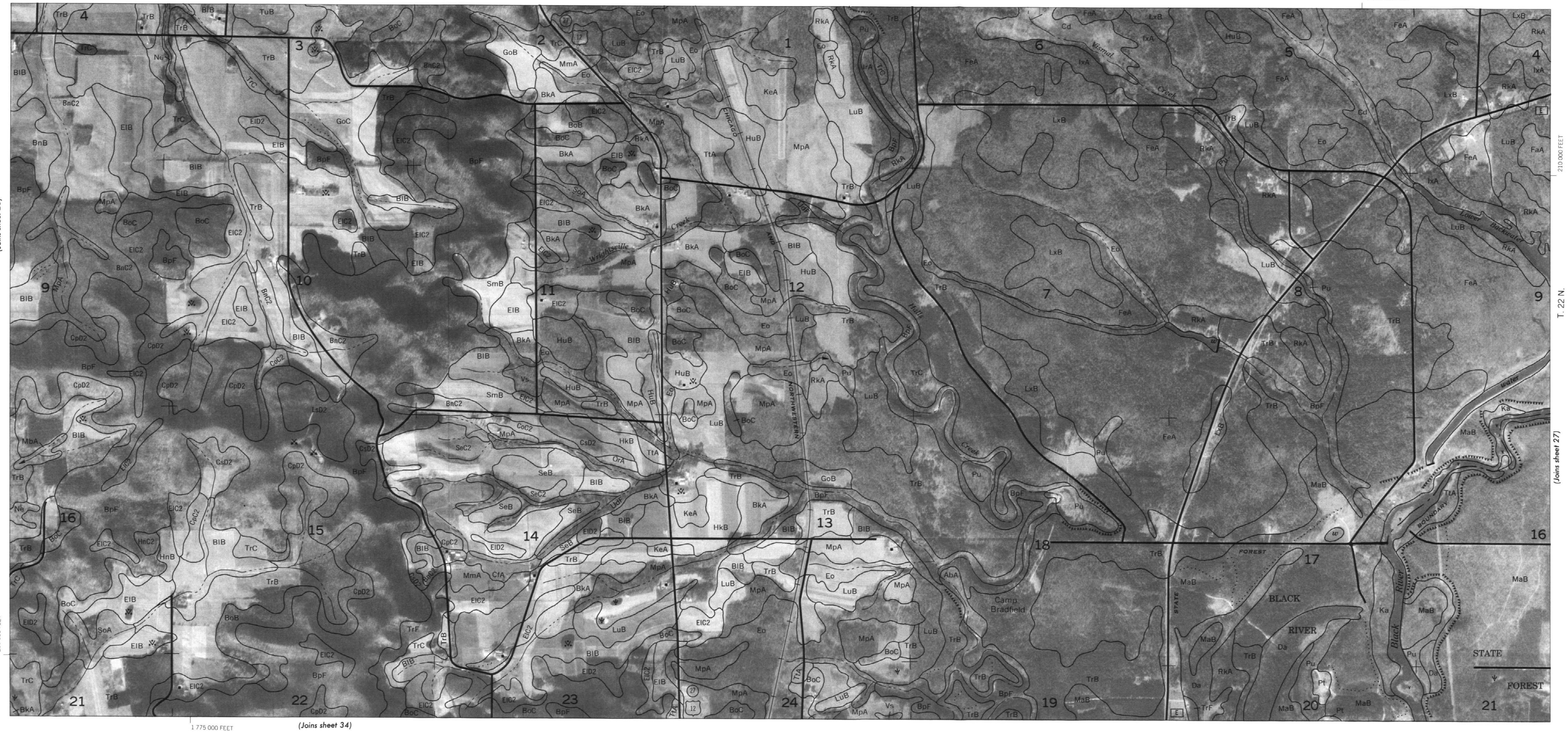
SOIL SURVEY OF JACKSON COUNTY, WISCONSIN — SHEET NUMBER 26

N

(Joins sheet 18)

R 4 W. | R. 3 W.

1 800 000 FEET



210 000 FEET

T. 22 N.

(Joins sheet 25)

(Joins sheet 27)

SCALE 1:20 000

1 MILE

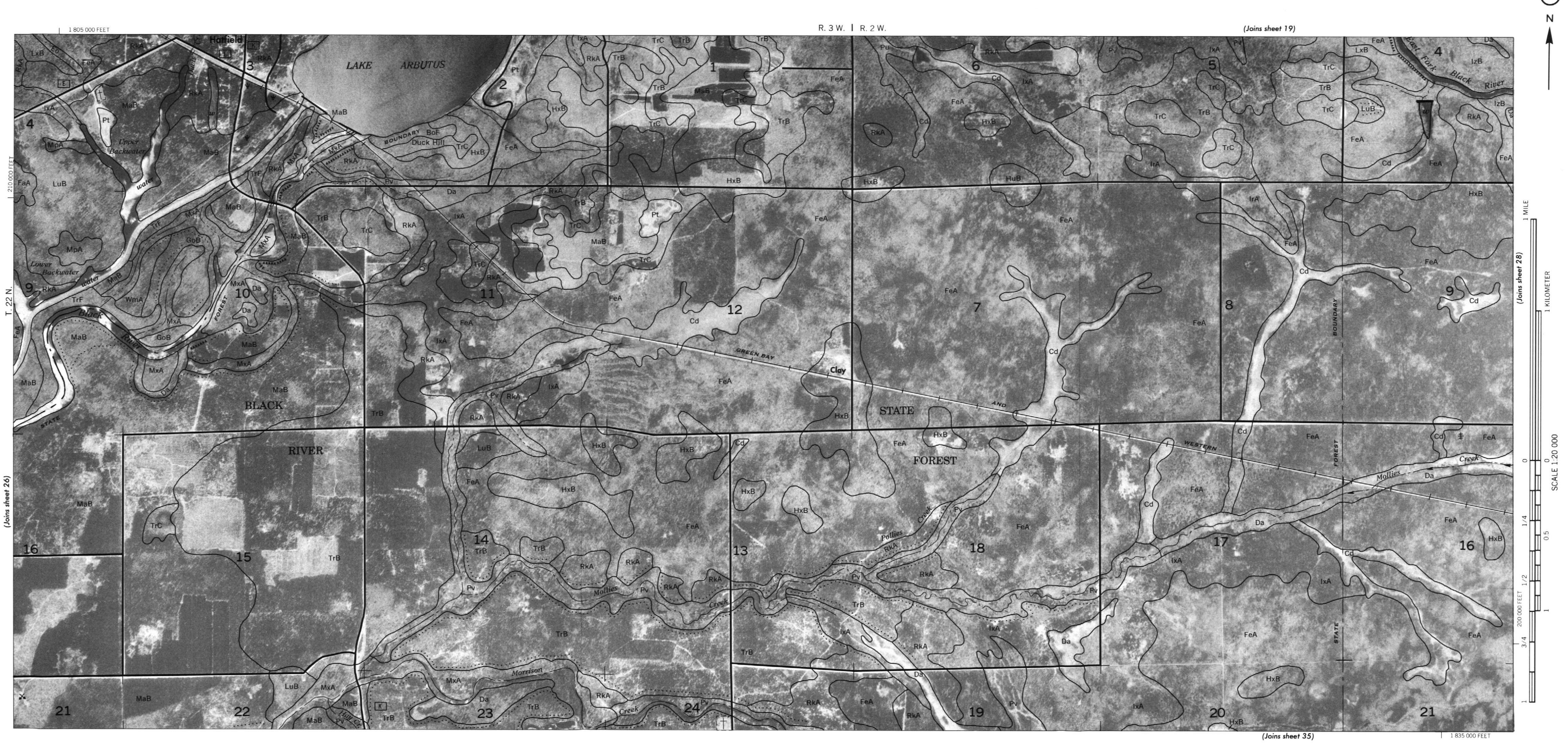
1 KILOMETER

200 000 FEET

1 775 000 FEET

(Joins sheet 34)

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey from 1976-1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.
Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey from 1976-1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

(Joins sheet 20)

R. 2 W. | R. 1 W.

1 865 000 FEET

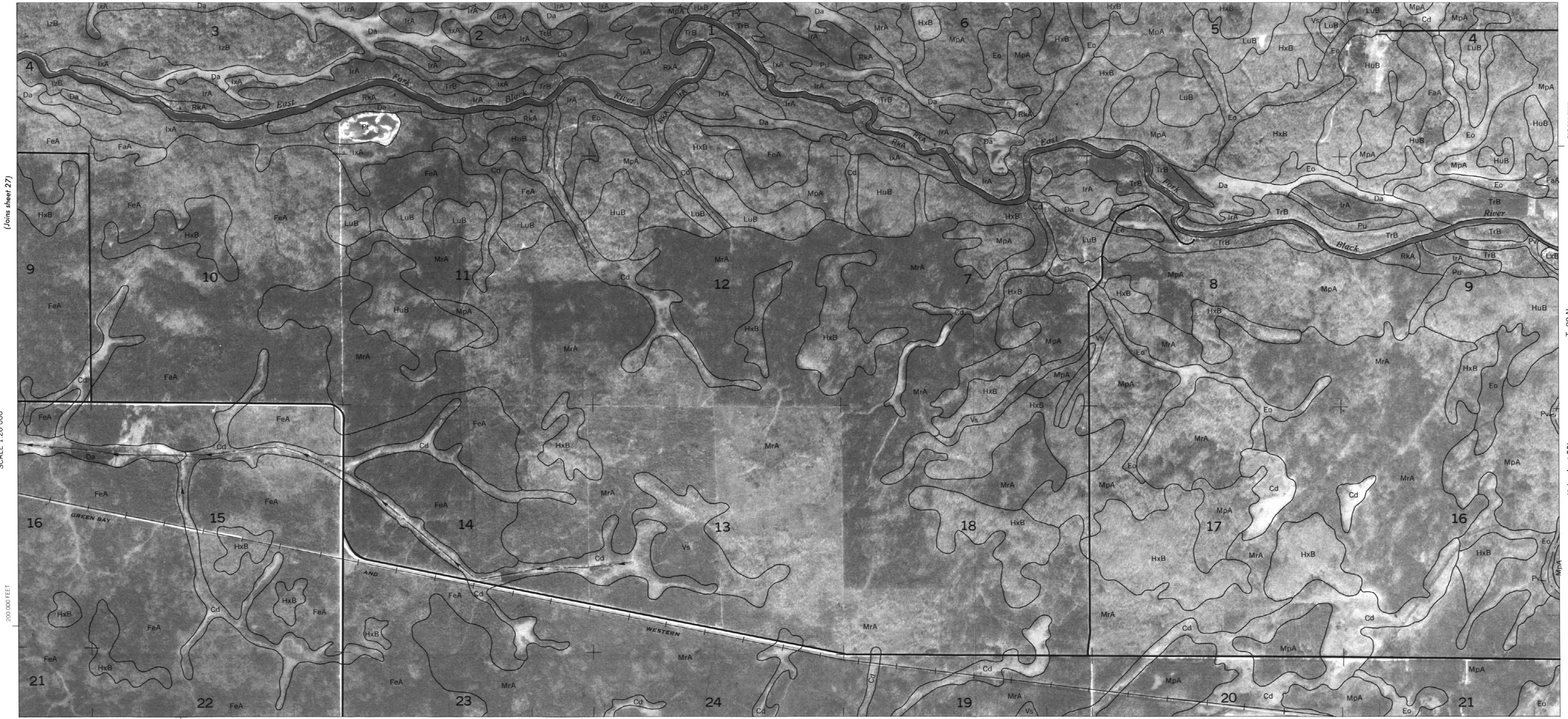
(Joins sheet 27)

210 000 FEET

T. 22 N.

(Joins sheet 29)

200 000 FEET



1 840 000 FEET

(Joins sheet 36)

1 MILE

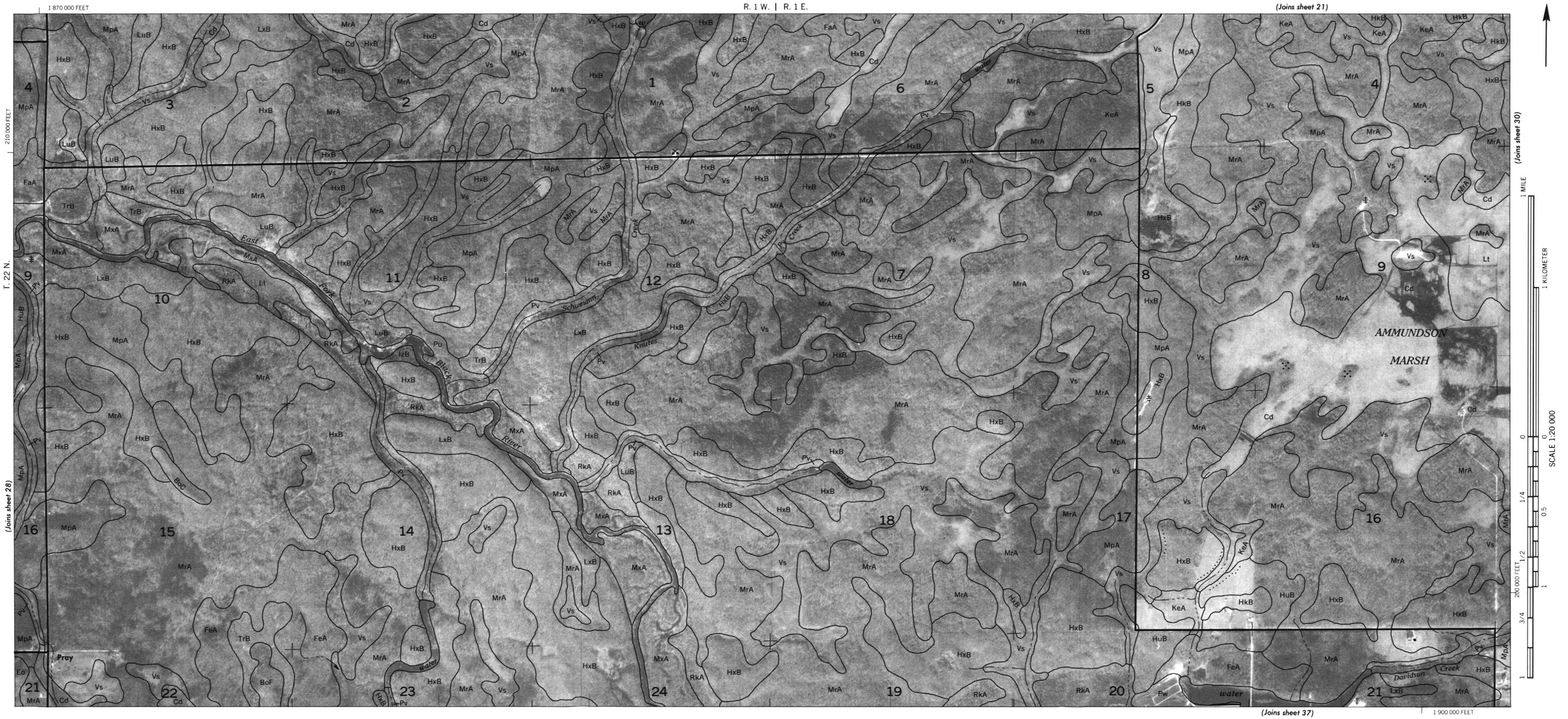
1 KILOMETER

SCALE 1:20 000

0 1/4 1/2 3/4 1

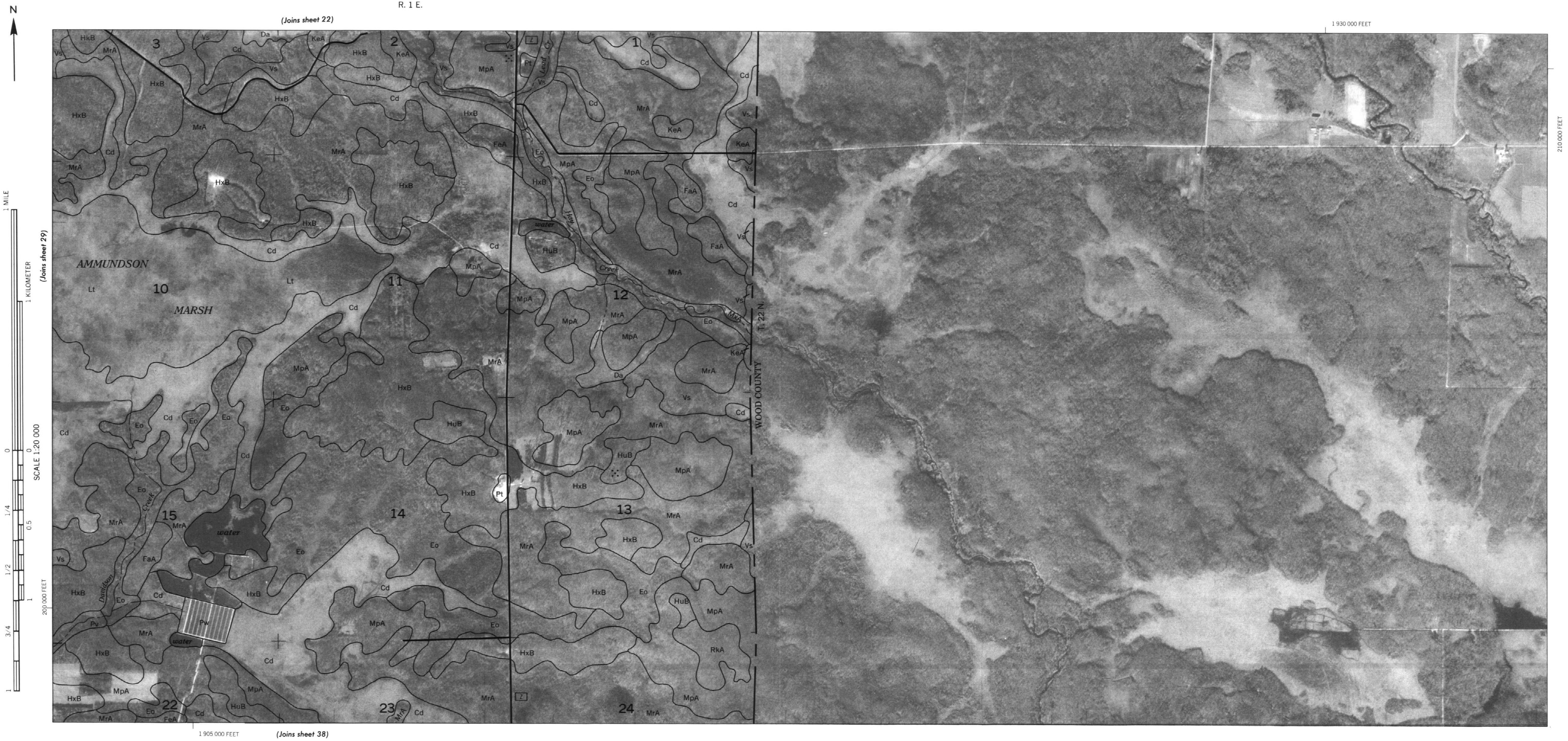
0 0.5 1

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey from 1976-1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



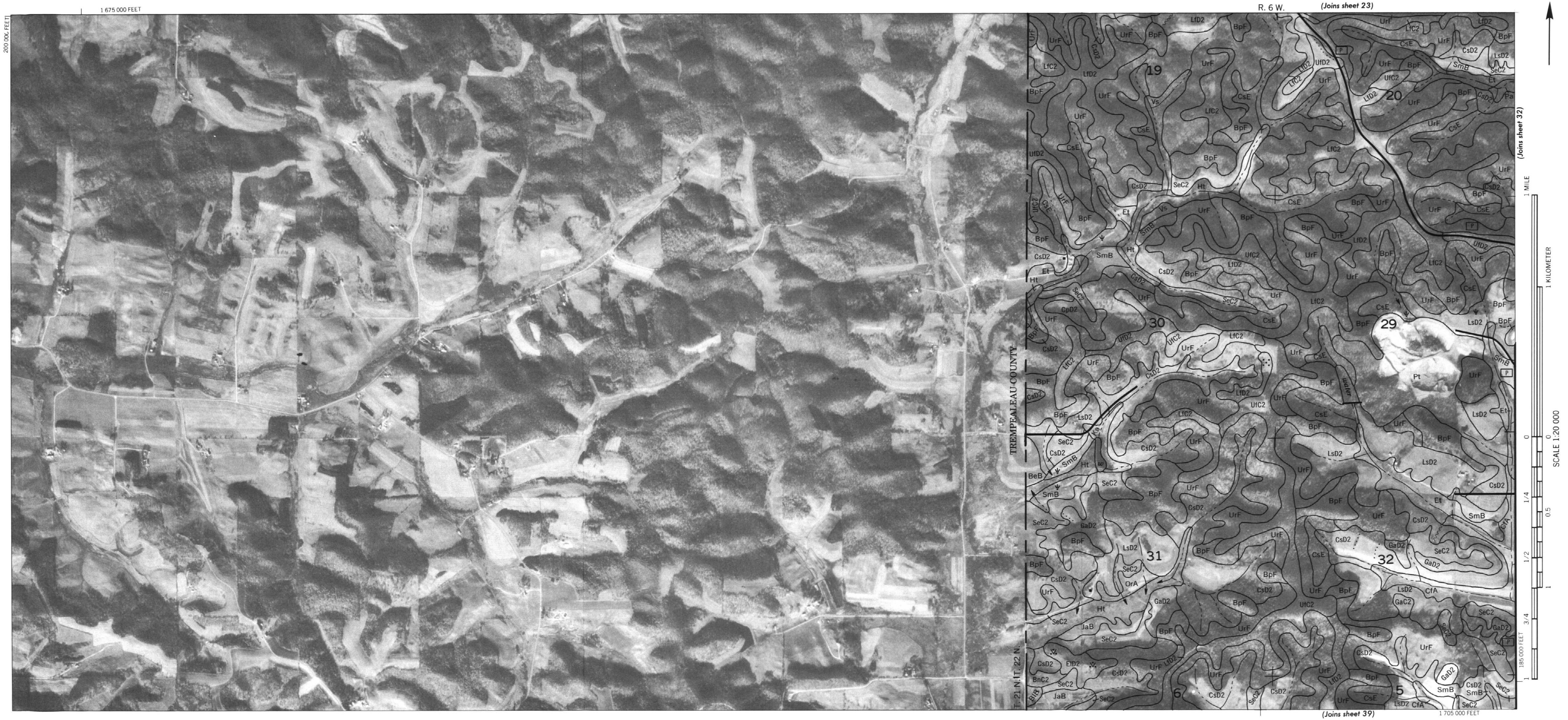
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey from 1976-1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL SURVEY OF JACKSON COUNTY, WISCONSIN — SHEET NUMBER 30



This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey from 1976-1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey from 1976-1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey from 1976-1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey from 1976-1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL SURVEY OF JACKSON COUNTY, WISCONSIN — SHEET NUMBER 34

N

(Joins sheet 26)

R. 4 W. | R. 3 W.

1 800 000 FEET

(Joins sheet 33)

(Joins sheet 35)

195 000 FEET

185 000 FEET

1 MILE

1 KILOMETER

SCALE 1:20 000

0 1/4 1/2 3/4 1

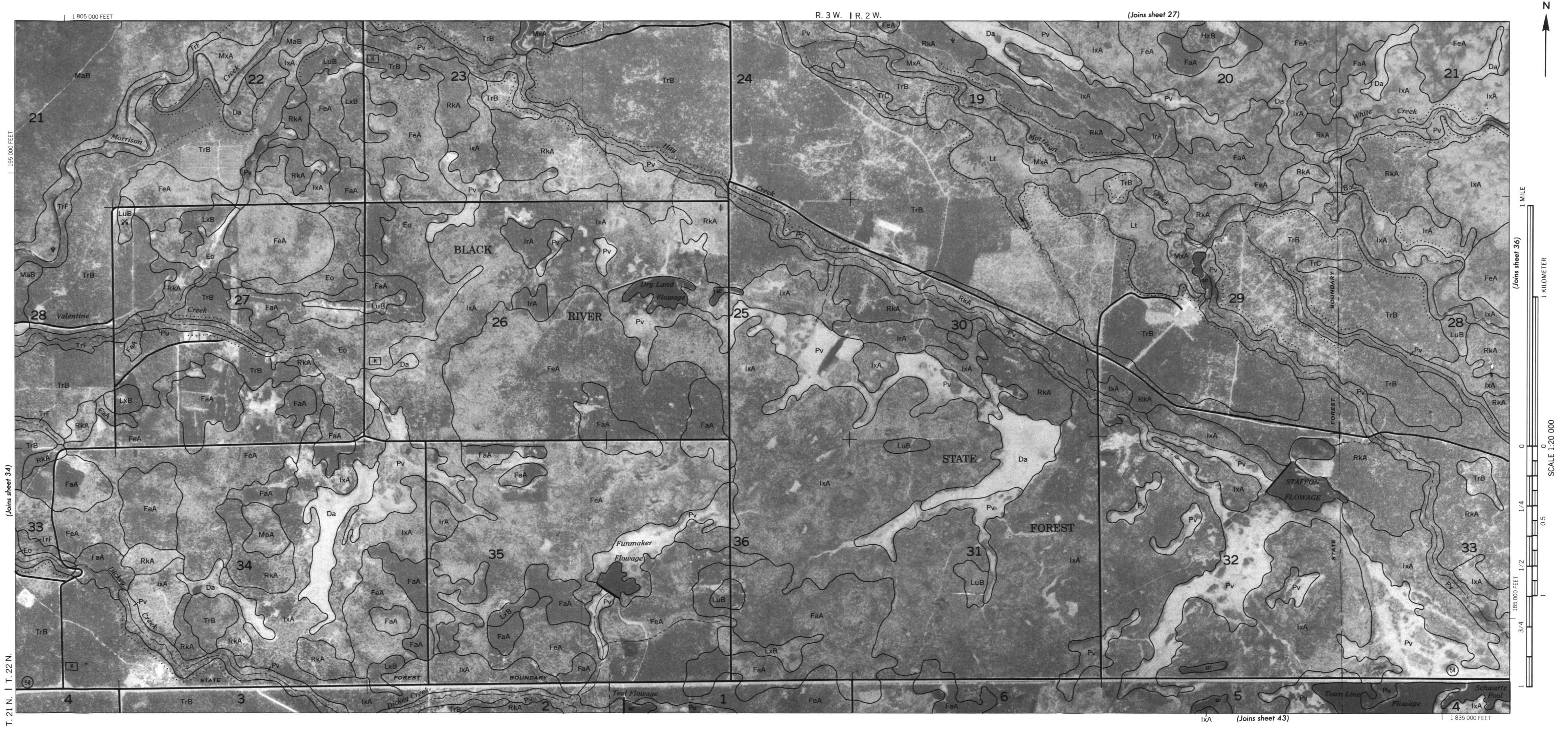
0 0.5 1

(Joins sheet 42)

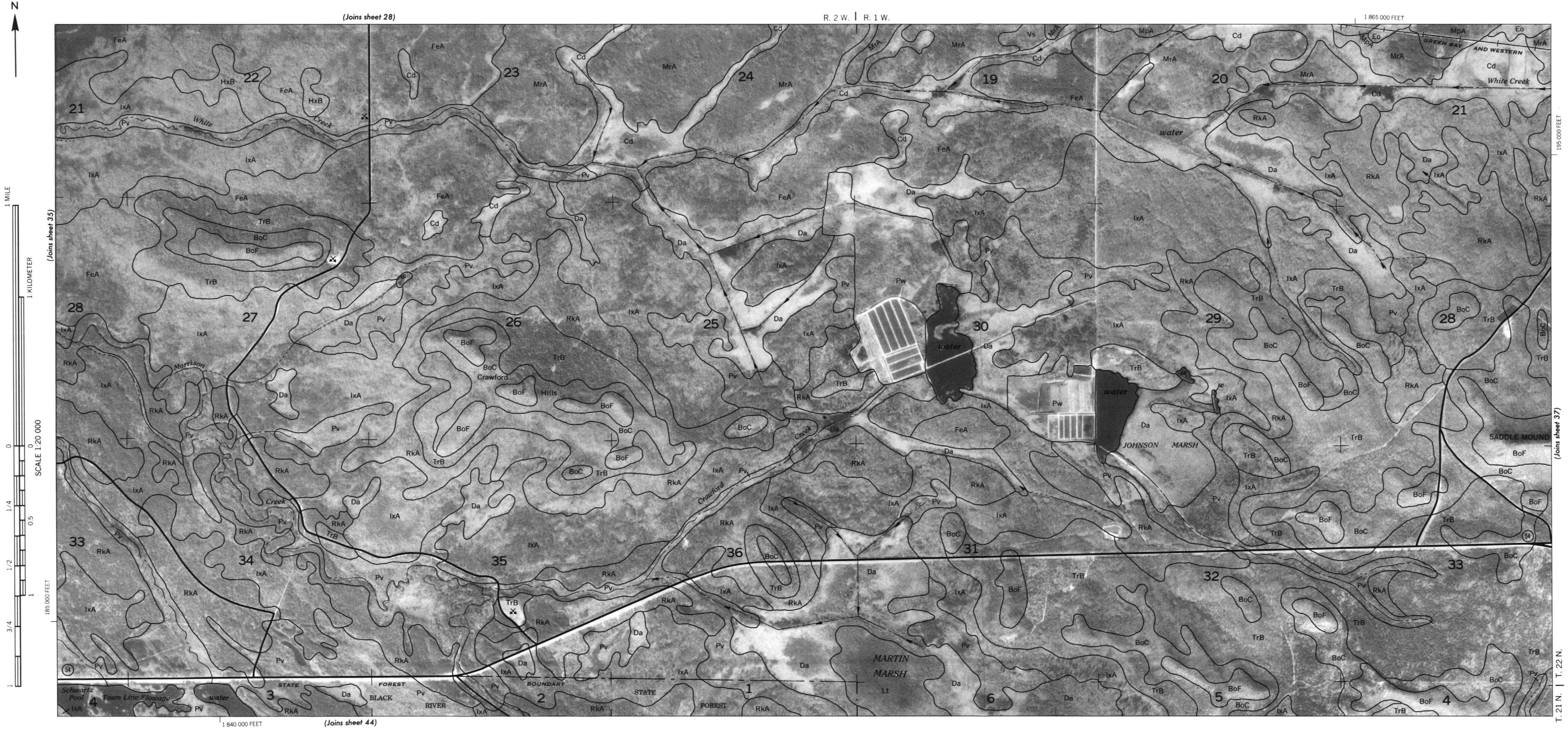
1 775 000 FEET

T. 22 N. | T. 21 N.

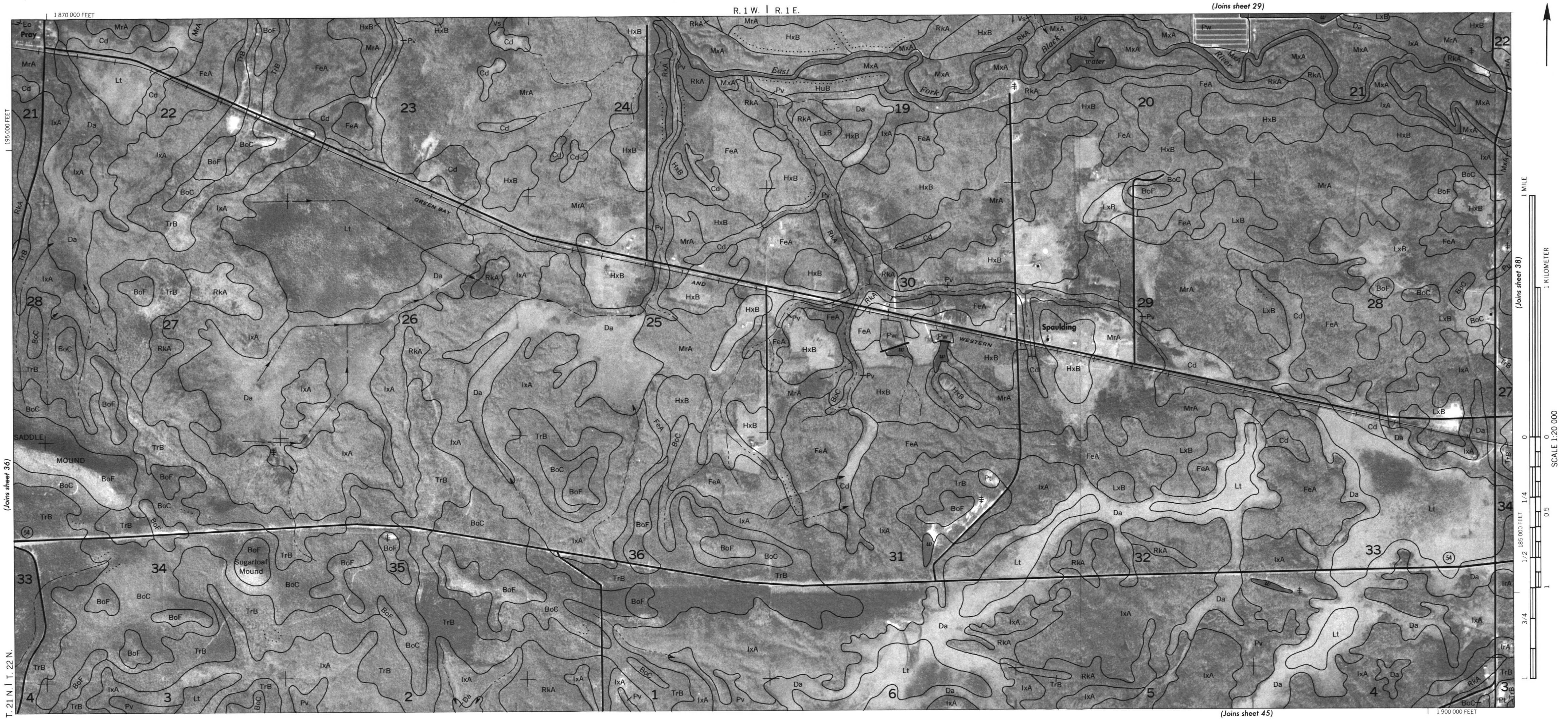
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey from 1976-1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey from 1976-1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

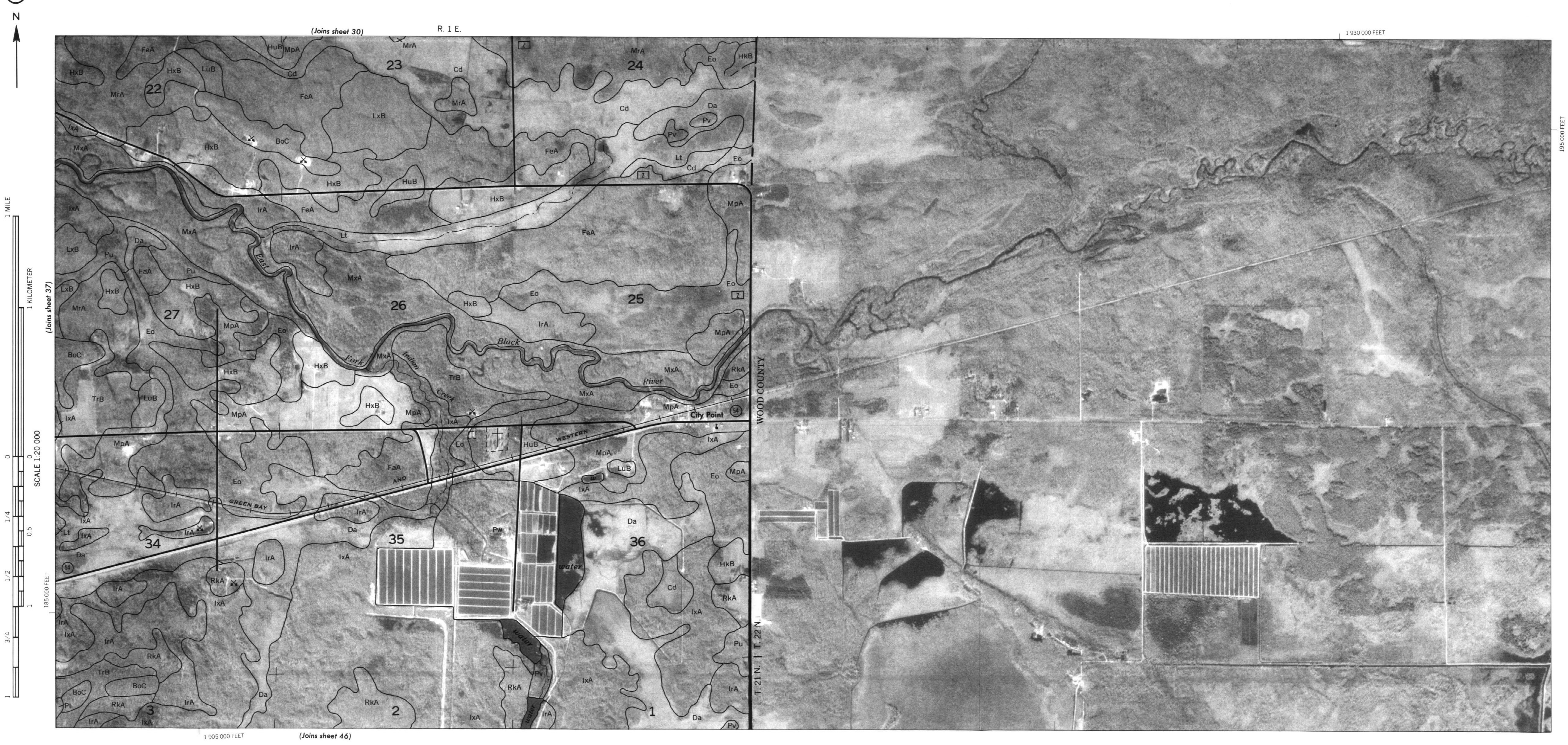


This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey from 1976-1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey from 1976-1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL SURVEY OF JACKSON COUNTY, WISCONSIN — SHEET NUMBER 38



This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey from 1976-1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey from 1976-1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

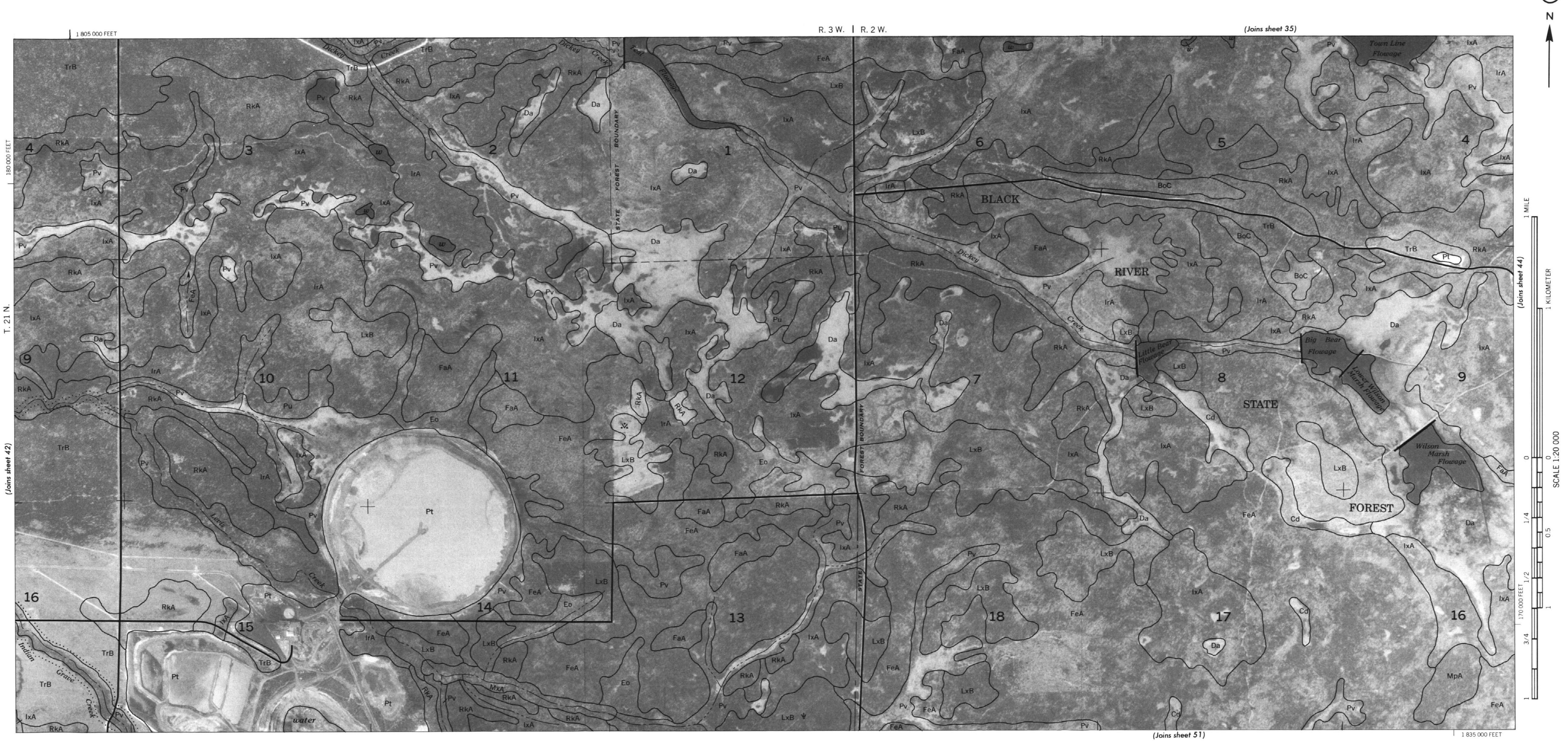
SOIL SURVEY OF JACKSON COUNTY, WISCONSIN — SHEET NUMBER 40

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey from 1976-1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Geological Survey from 1976-1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL SURVEY OF JACKSON COUNTY, WISCONSIN — SHEET NUMBER 42

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey from 1976-1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey from 1976-1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL SURVEY OF JACKSON COUNTY, WISCONSIN — SHEET NUMBER 44

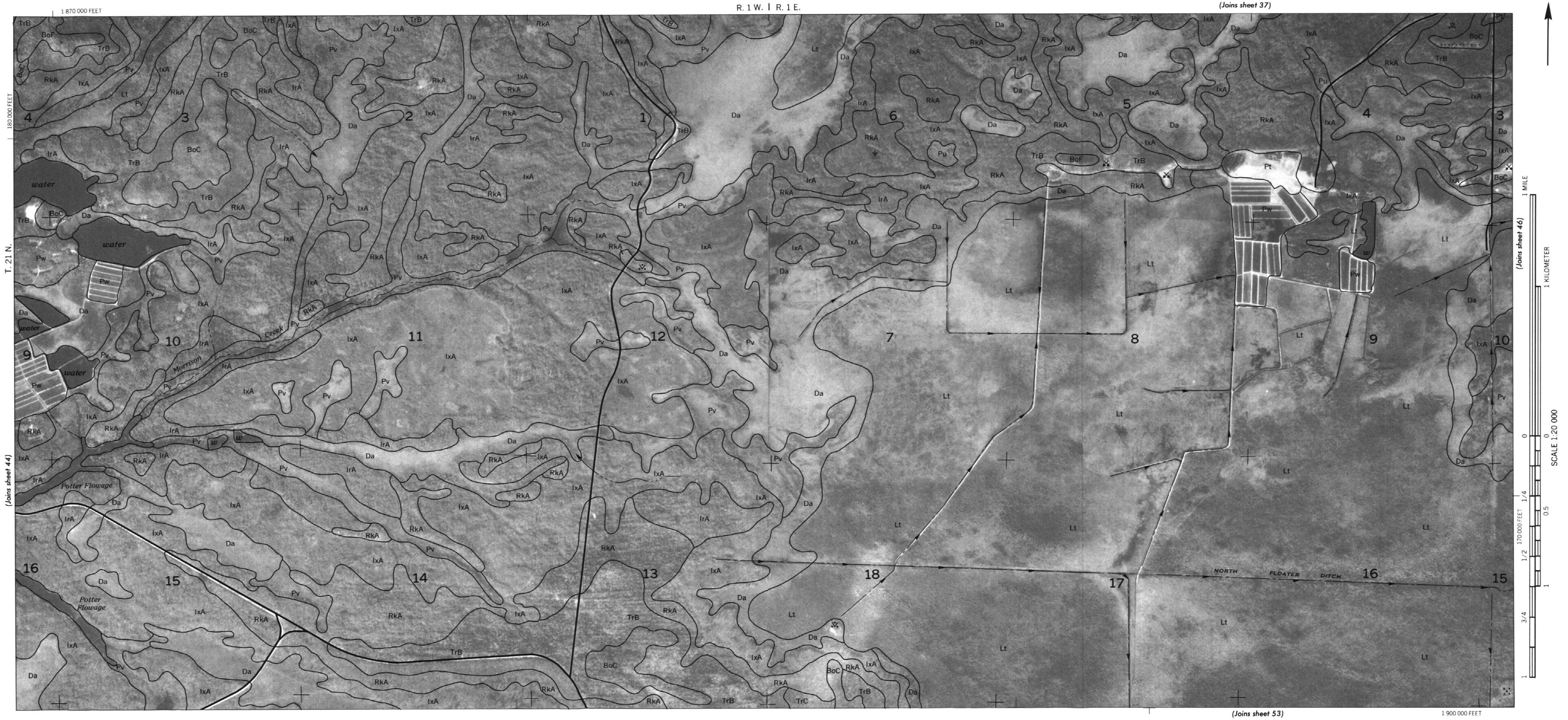
N

(Joins sheet 36)

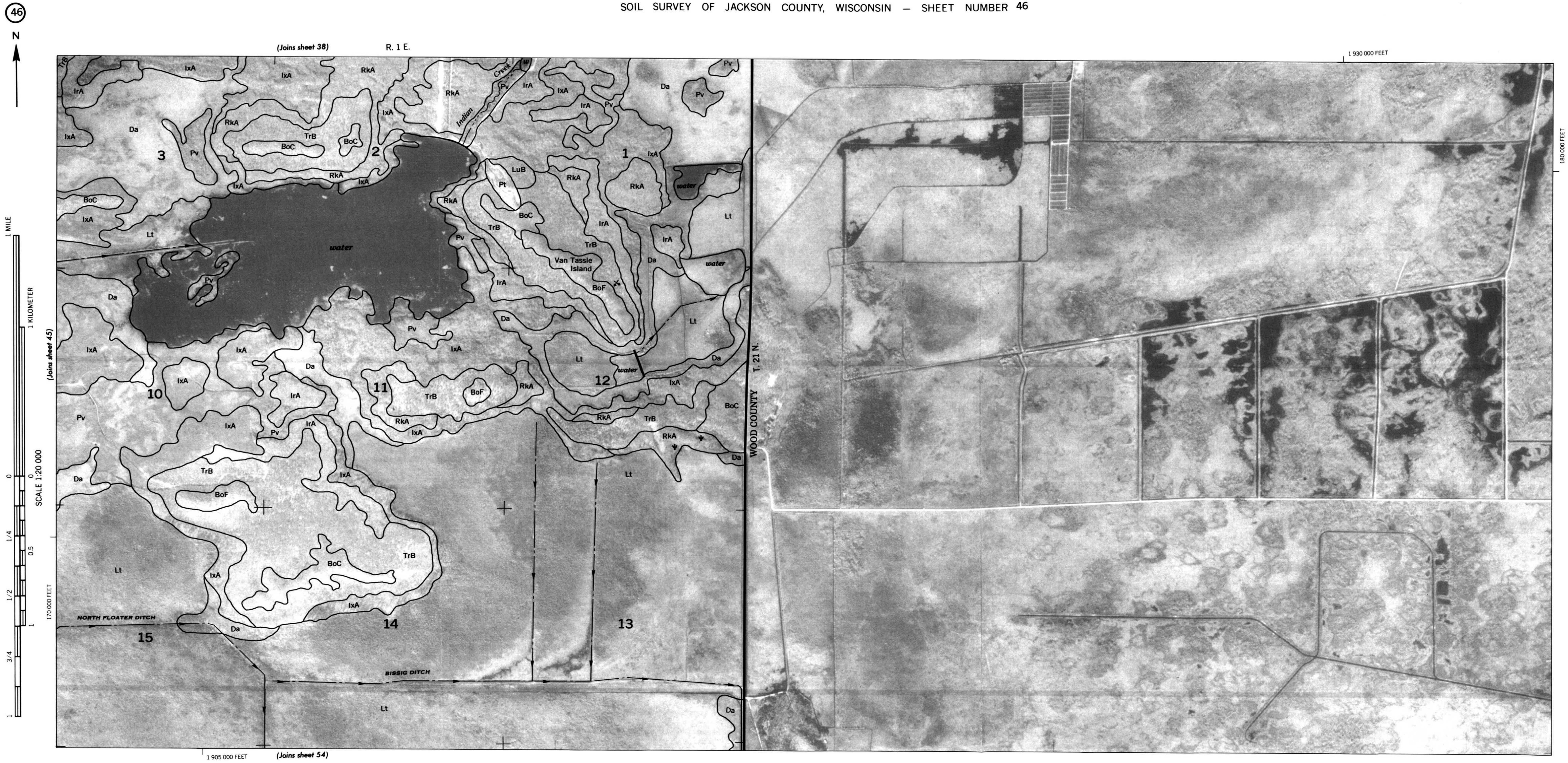
(Joins sheet 52)

1 MILE
1 KILOMETER
SCALE 1:20 000
0 1/4 1/2 3/4 1
0 0.5 1

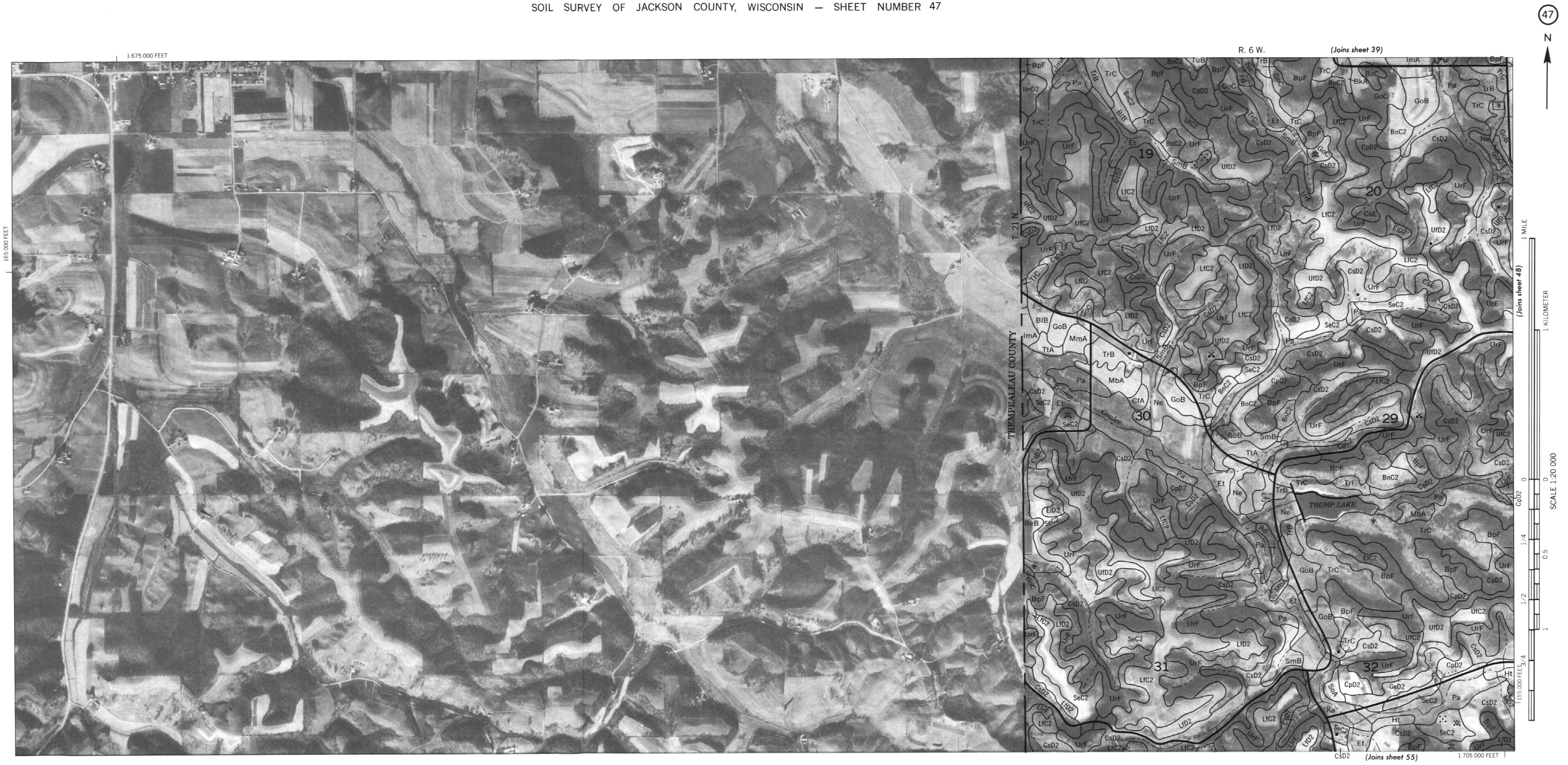
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey from 1976 - 1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



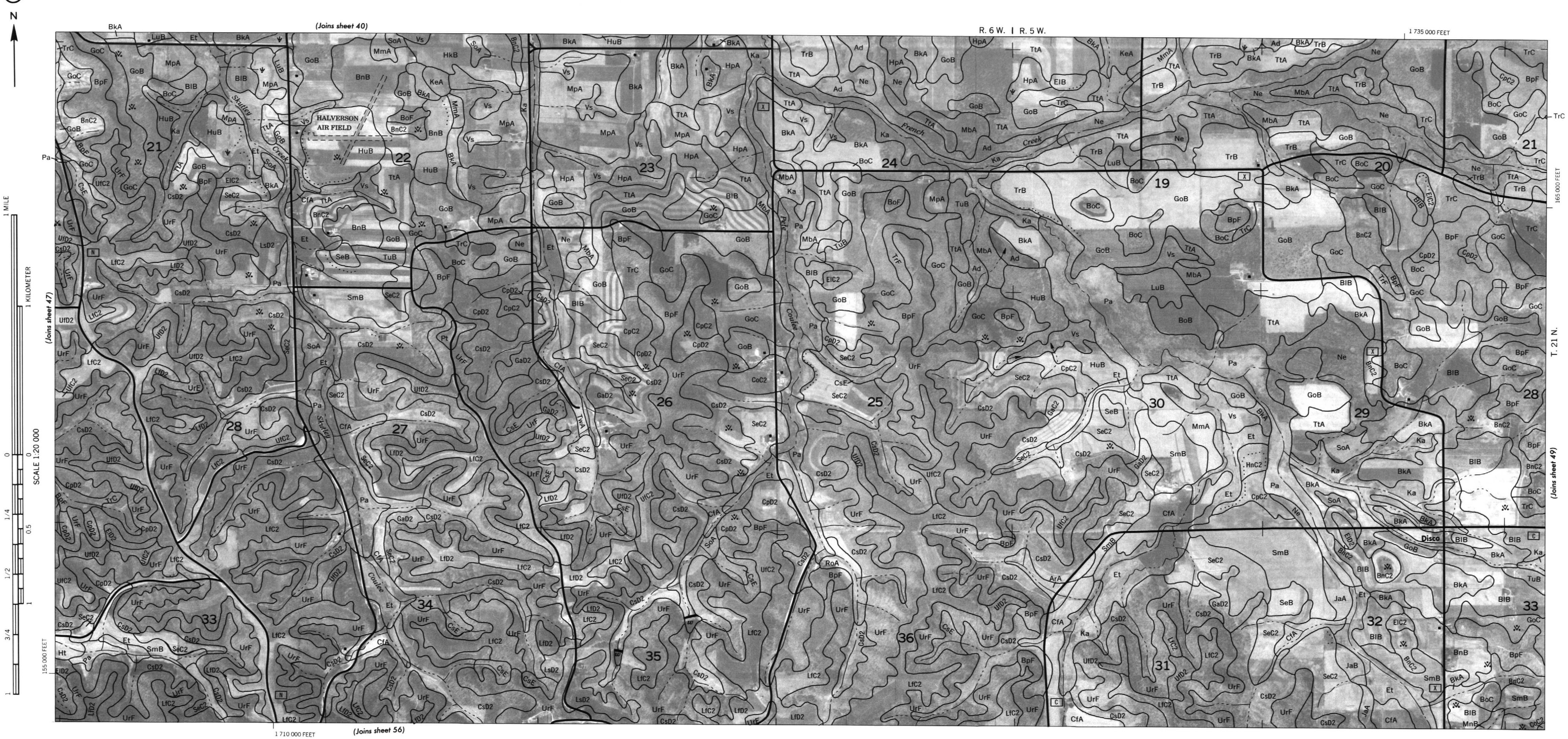
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey from 1976-1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey from 1976-1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

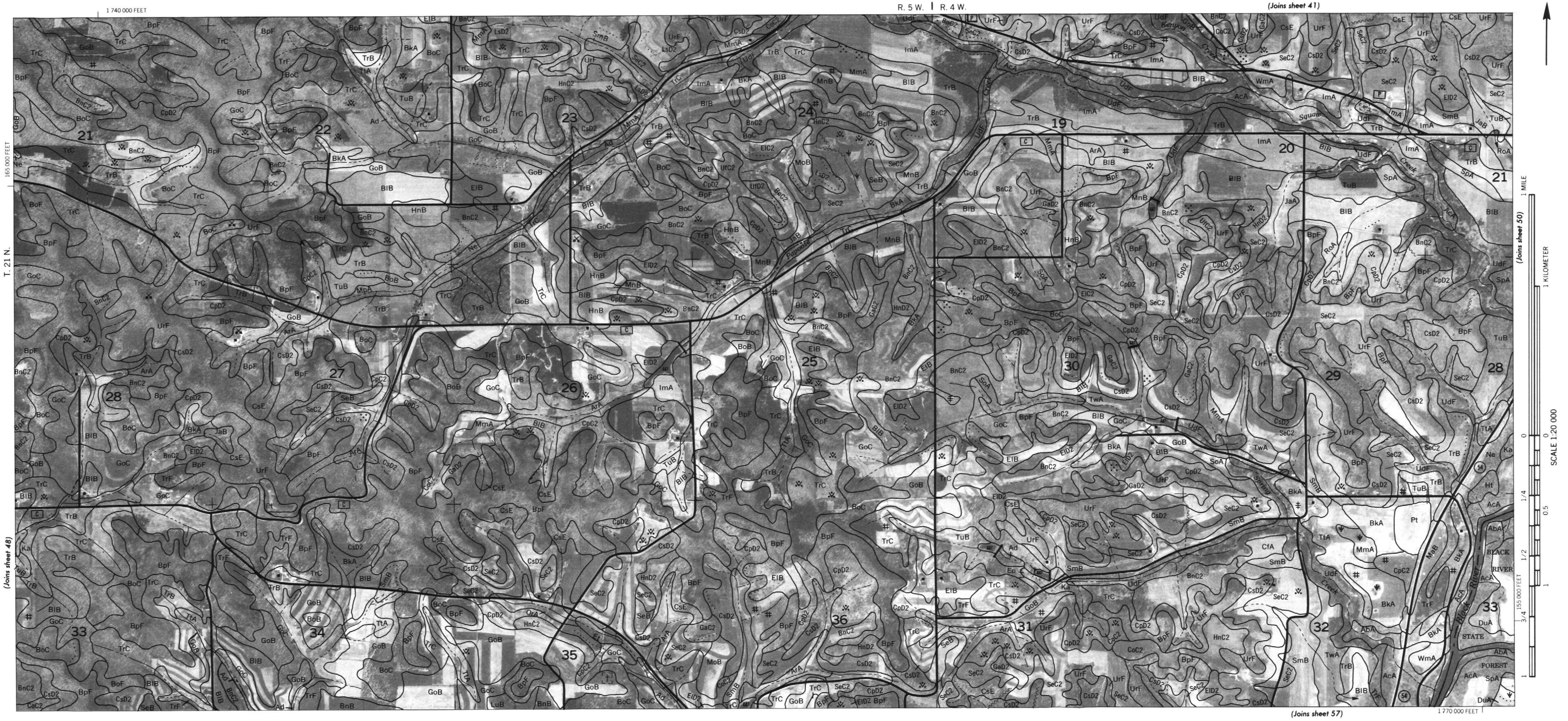


This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey from 1976-1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

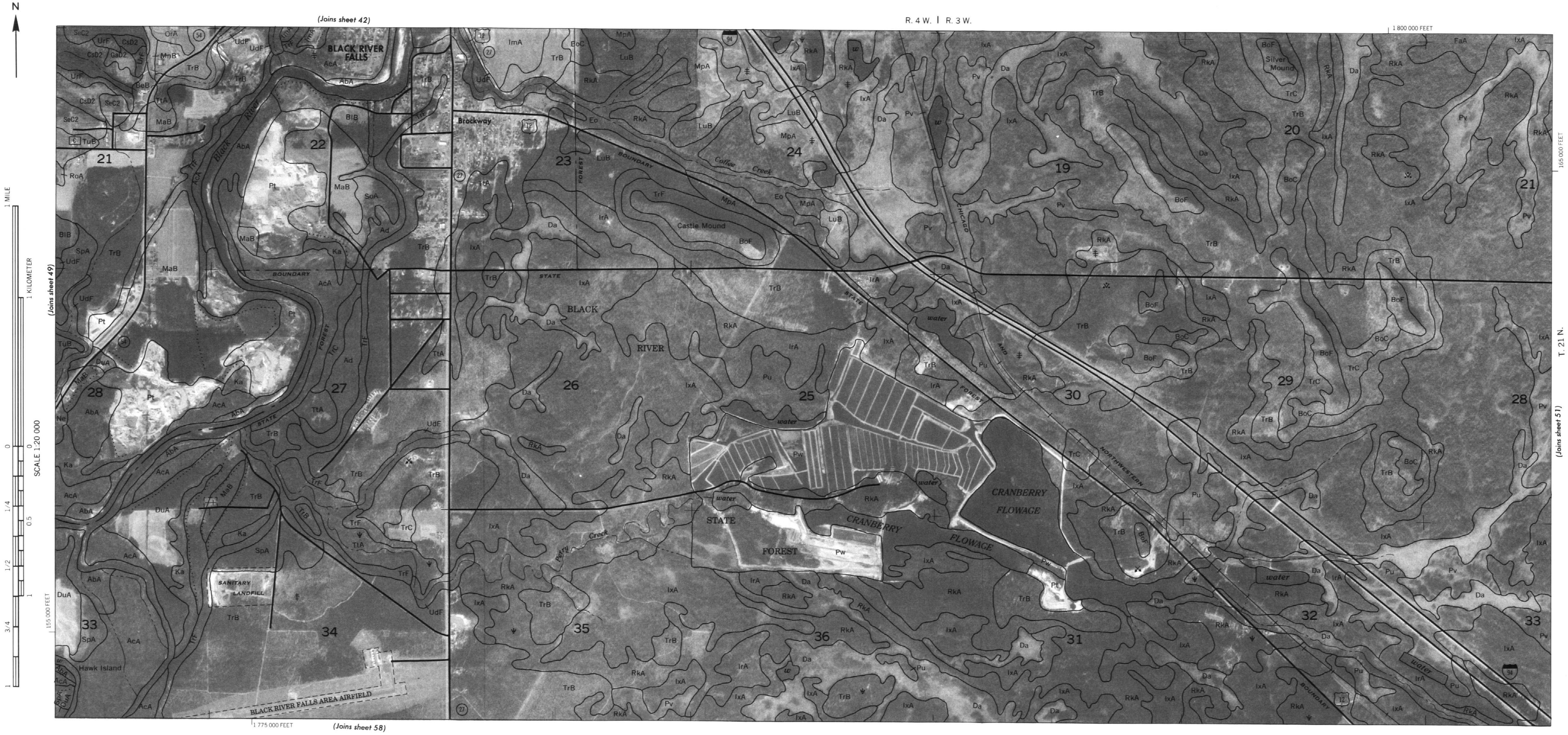


This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey from 1976-1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

49

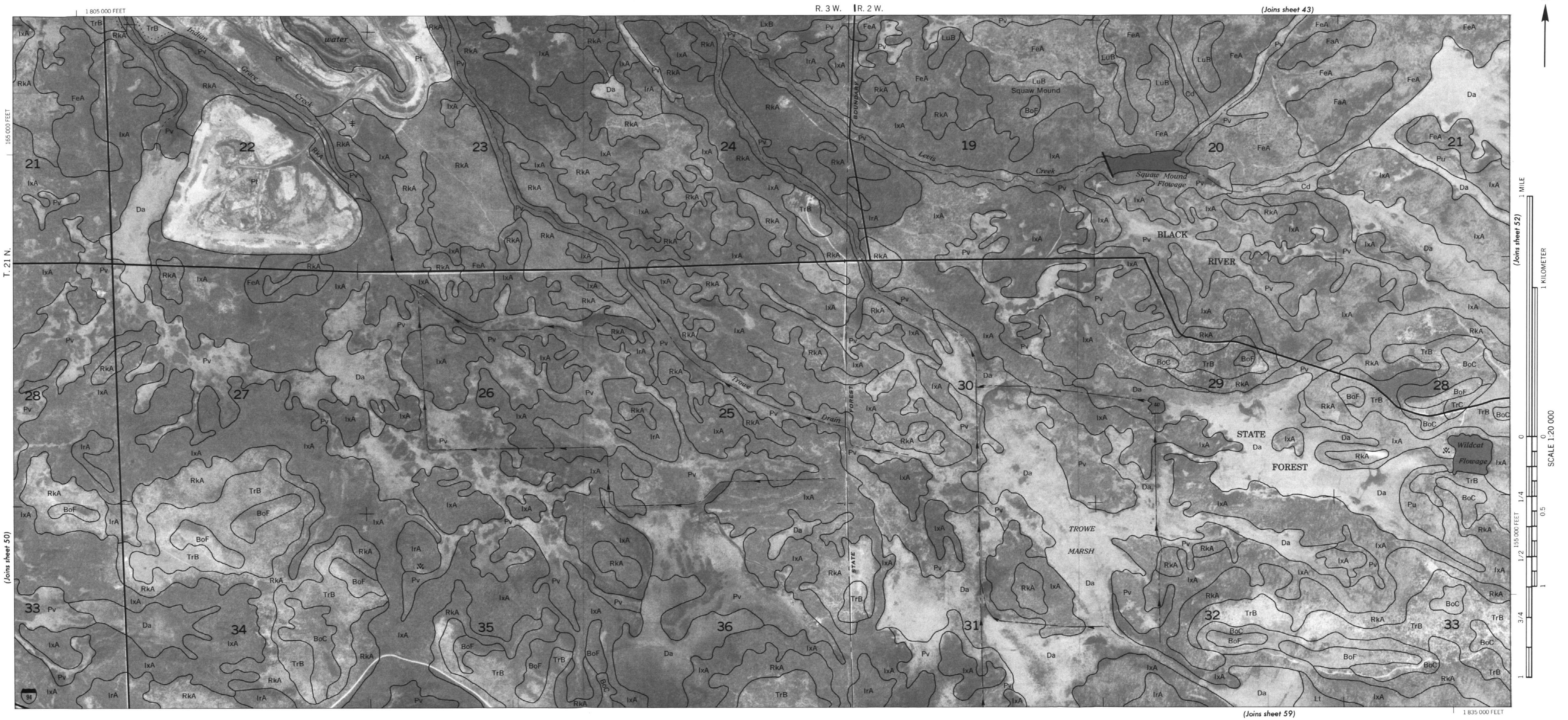


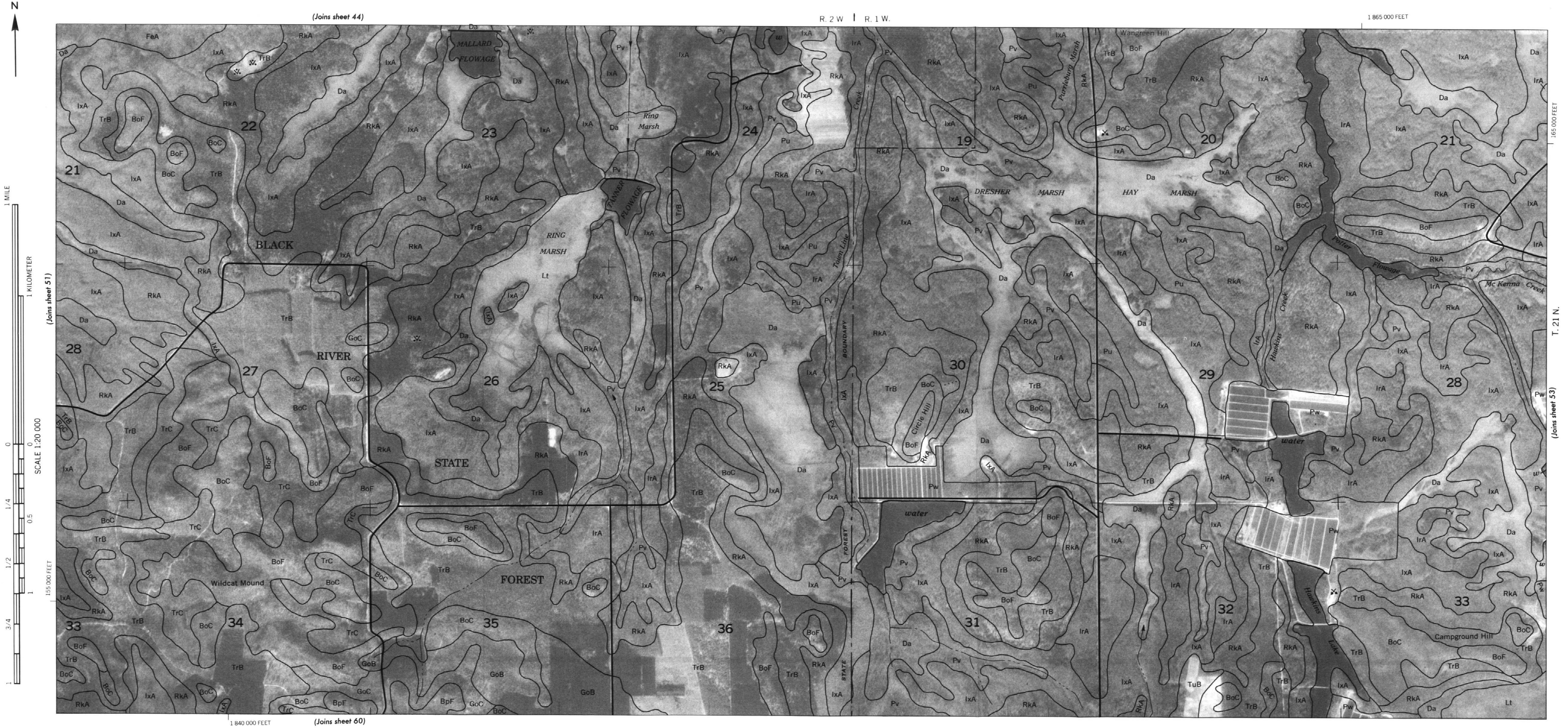
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey from 1976-1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey from 1976-1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

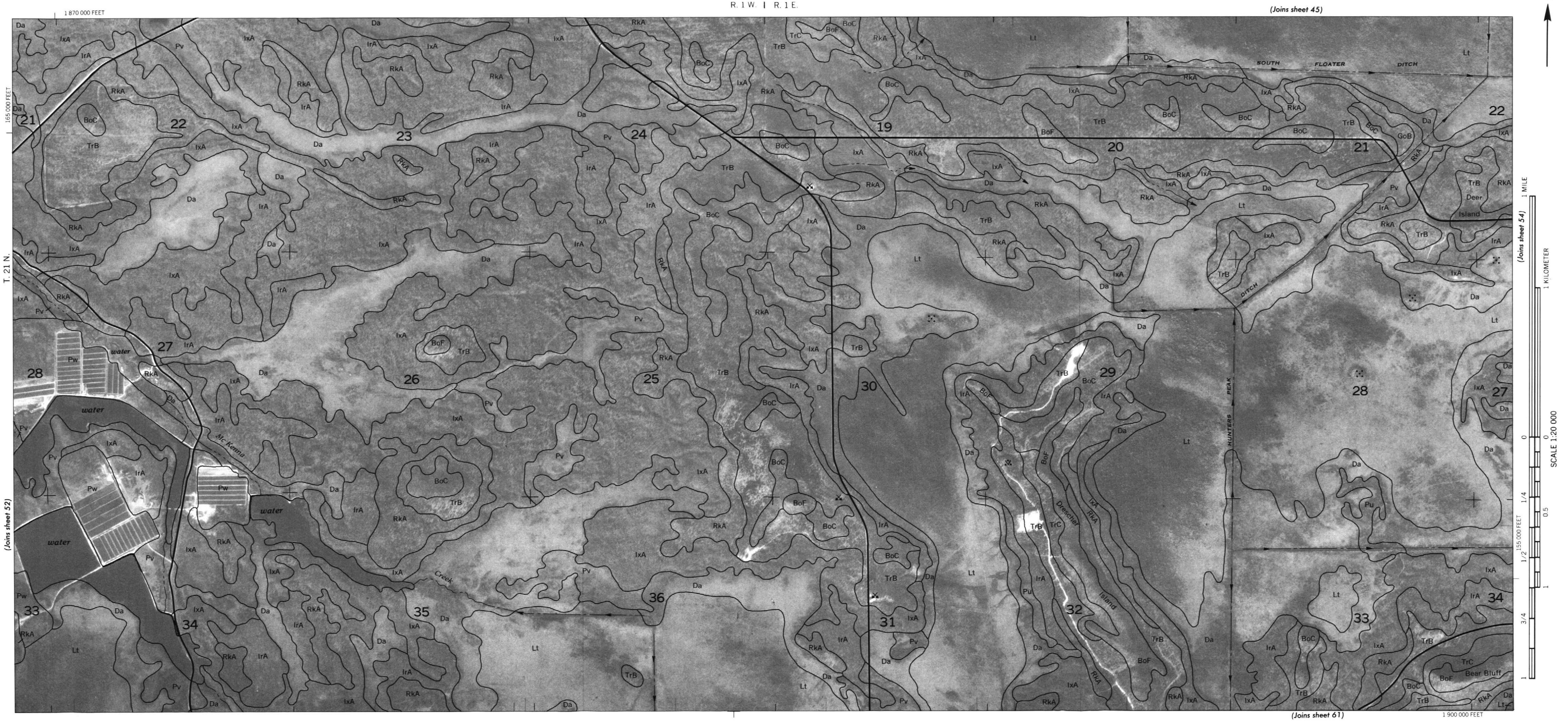
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey from 1976-1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

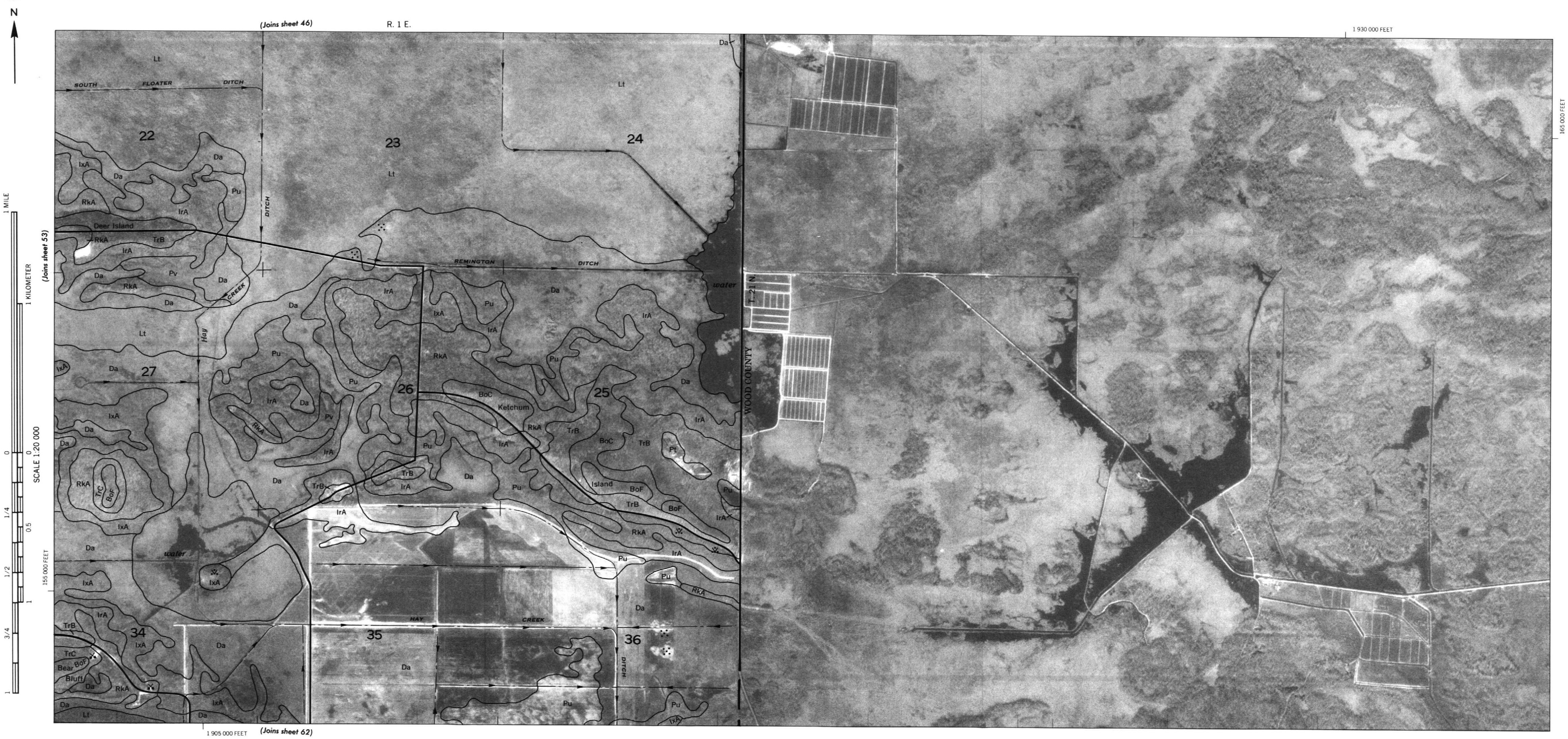




This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey from 1976-1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey from 1976-1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

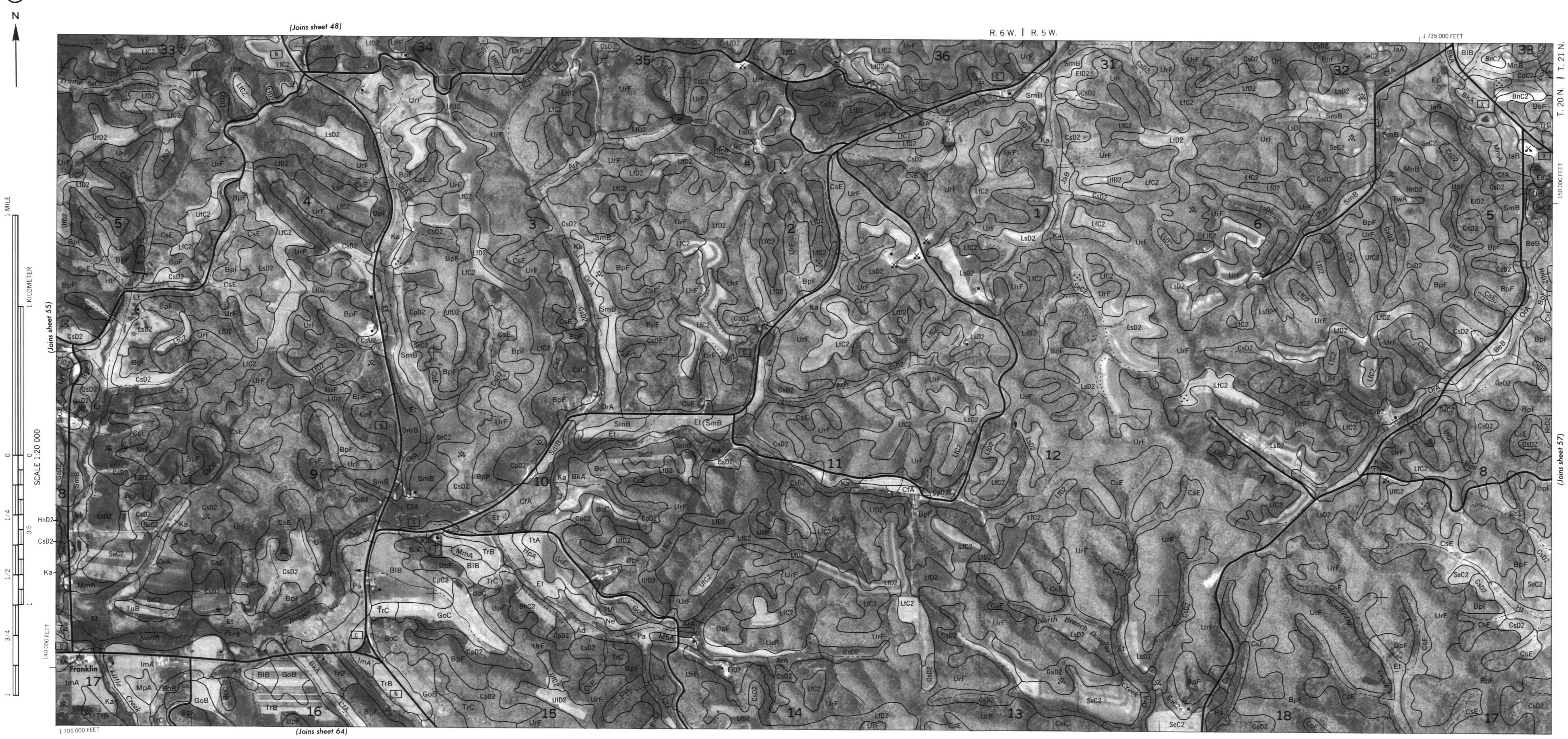




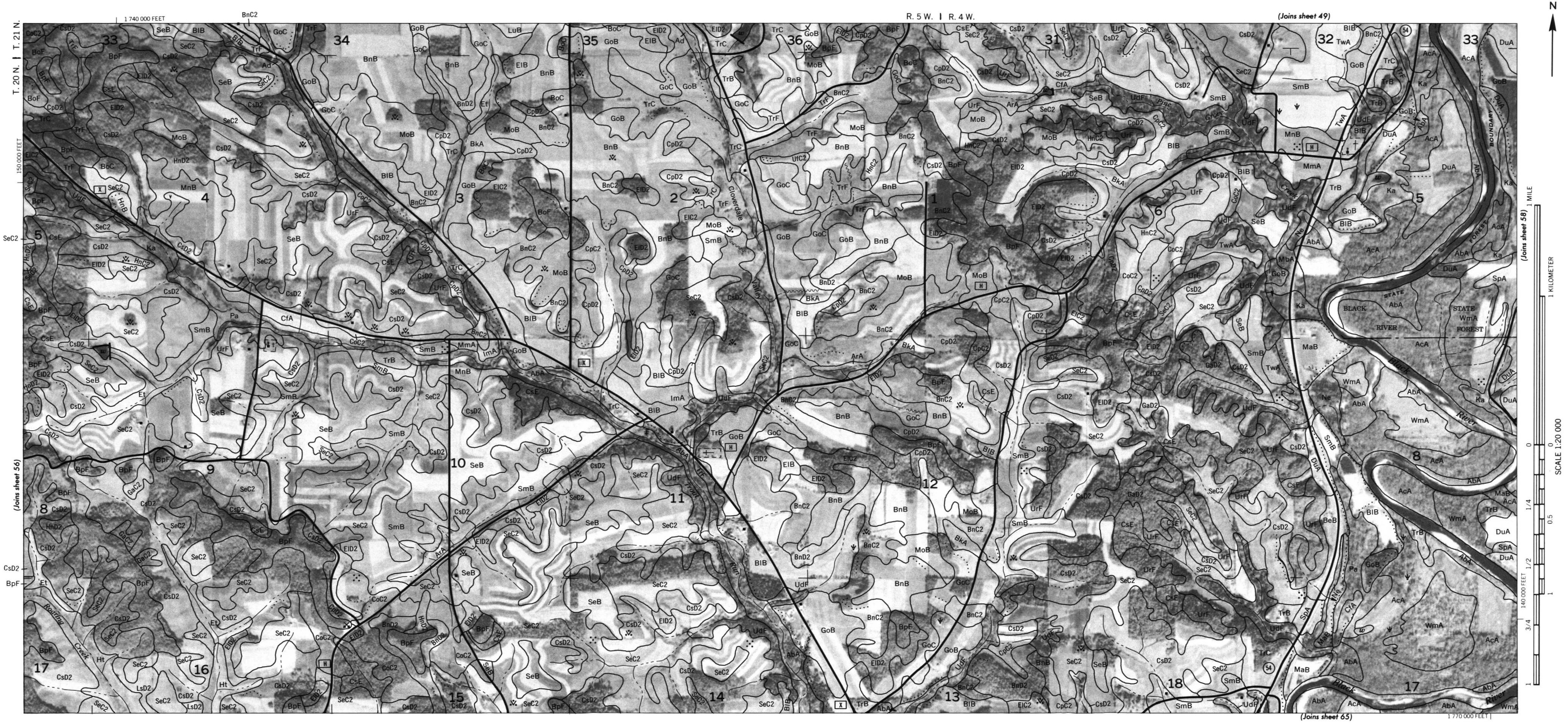
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey from 1976-1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey from 1976-1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL SURVEY OF JACKSON COUNTY, WISCONSIN — SHEET NUMBER 56

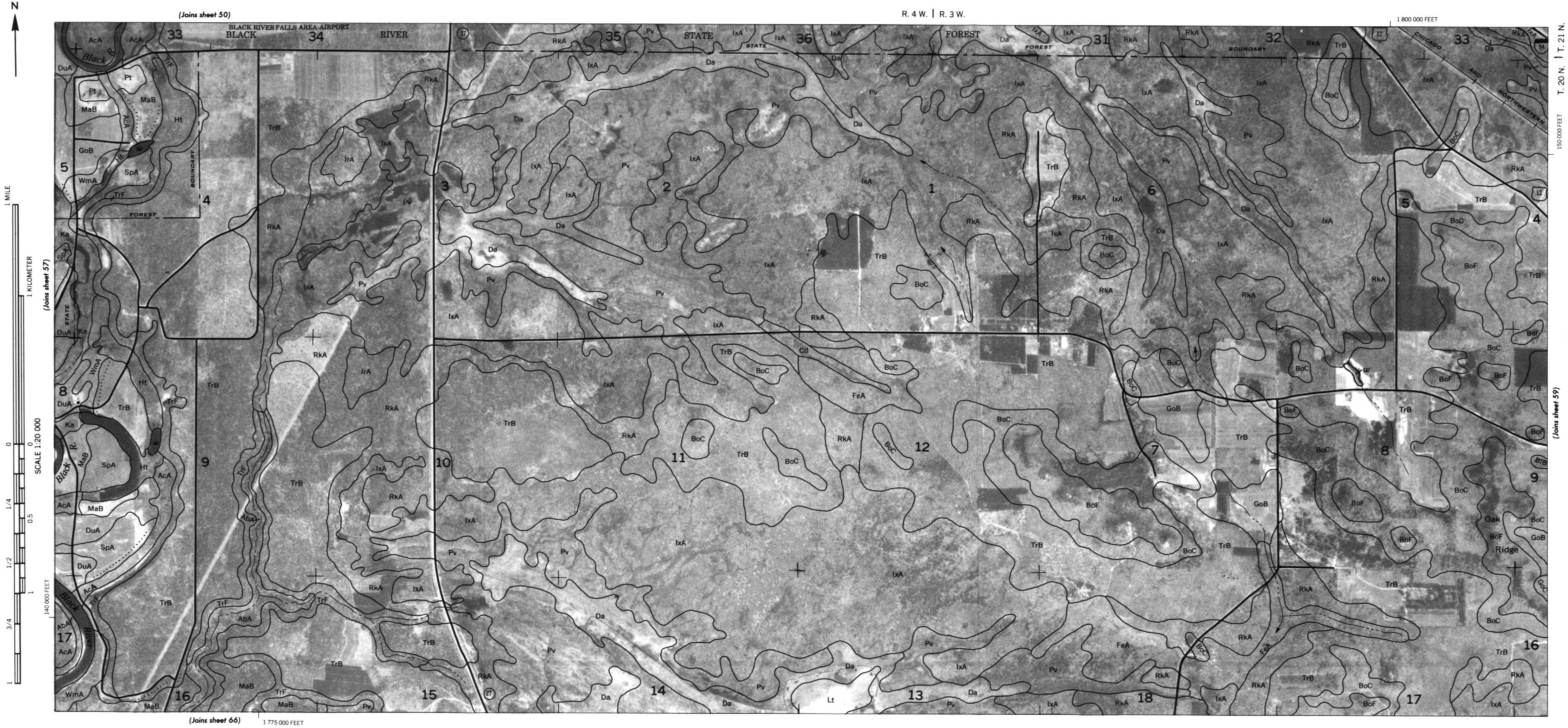


This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey from 1976–1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey from 1976-1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

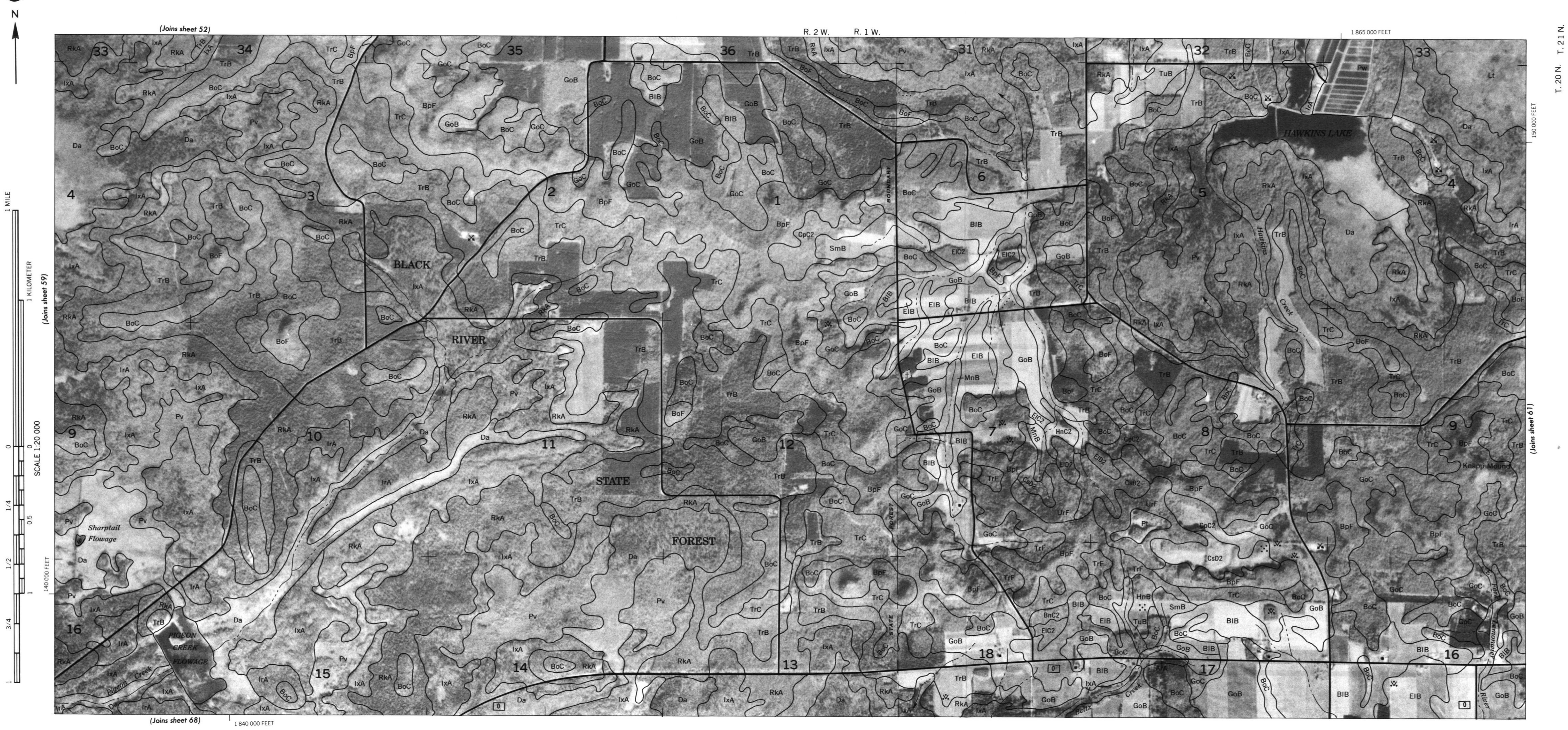
SOIL SURVEY OF JACKSON COUNTY, WISCONSIN — SHEET NUMBER 58



This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey from 1976-1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey from 1976-1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

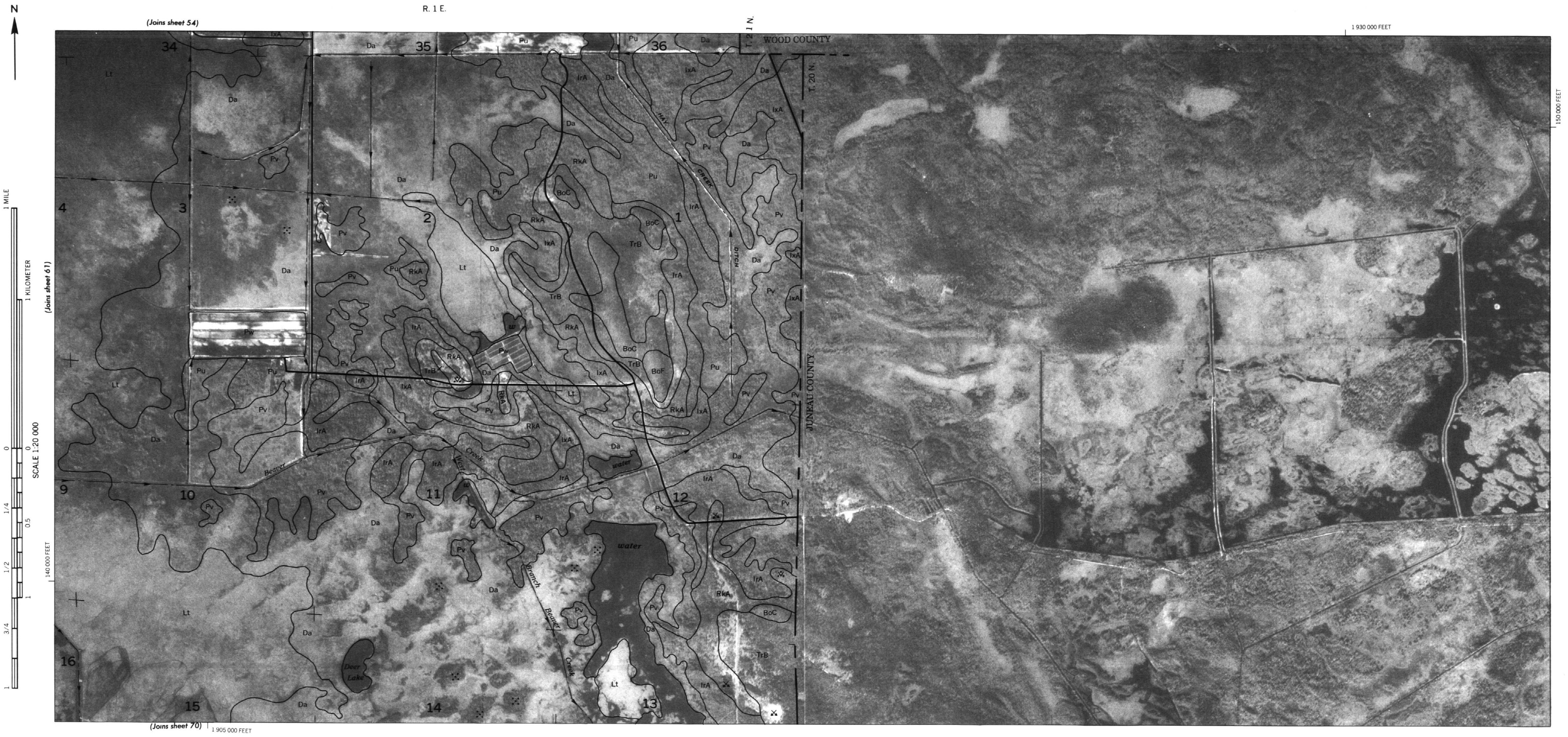
SOIL SURVEY OF JACKSON COUNTY, WISCONSIN — SHEET NUMBER 60



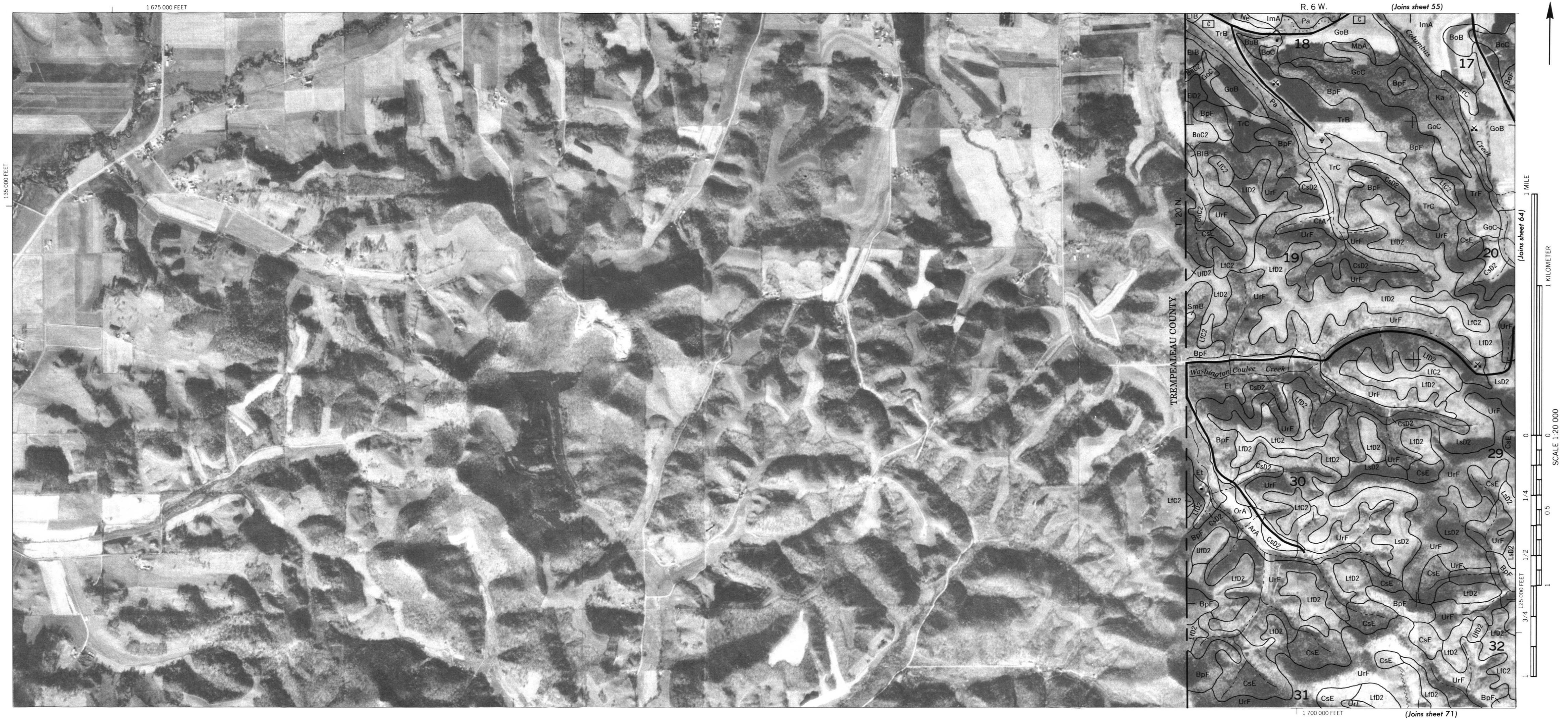
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey from 1976-1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey from 1976-1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL SURVEY OF JACKSON COUNTY, WISCONSIN — SHEET NUMBER 62



This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey from 1976-1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey from 1976-1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

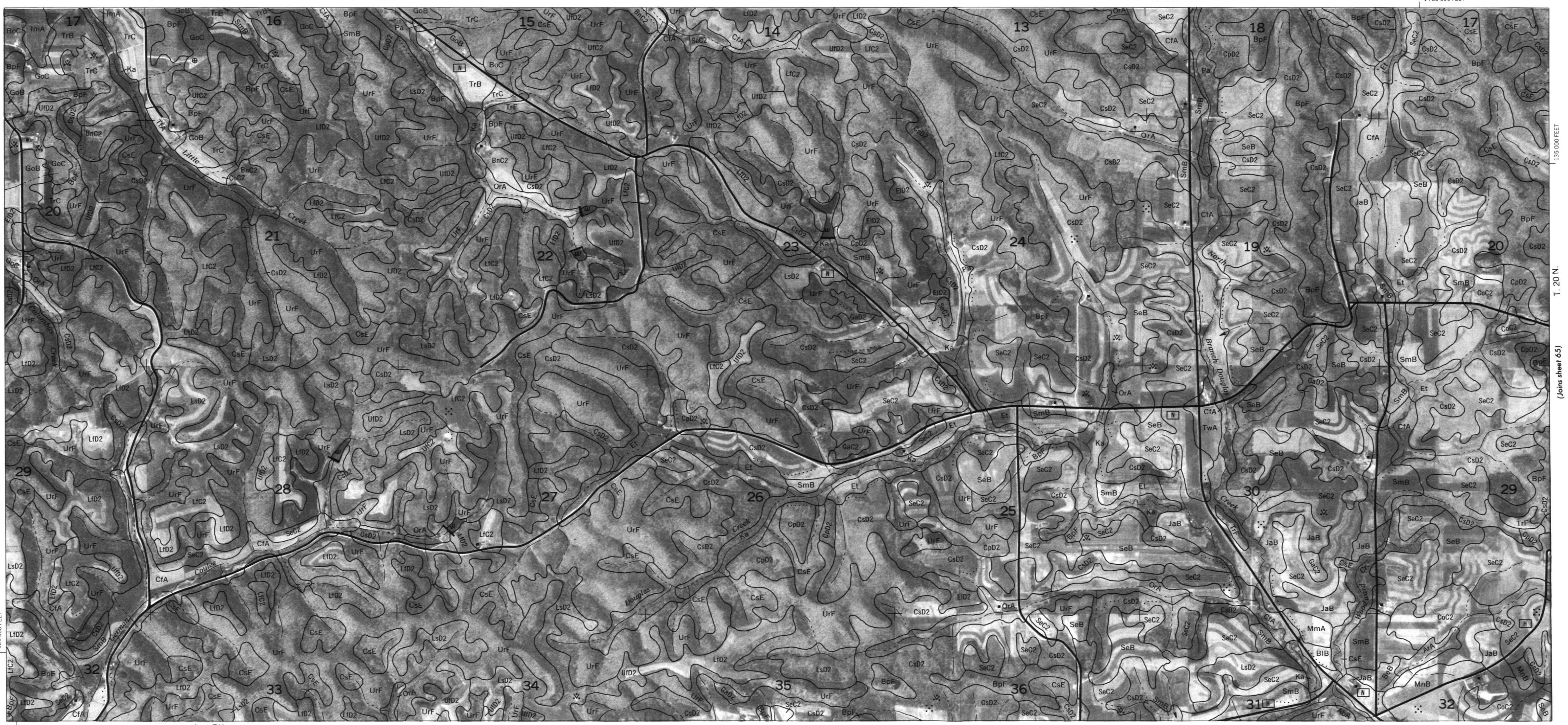
SOIL SURVEY OF JACKSON COUNTY, WISCONSIN — SHEET NUMBER 64

N

(Joins sheet 56)

R. 6 W. | R. 5 W.

1 735 000 FEET



(Joins sheet 63)

(Joins sheet 65)

135 000 FEET

T. 20 N.

125 000 FEET

1 705 000 FEET

(Joins sheet 72)

SCALE 1:20 000

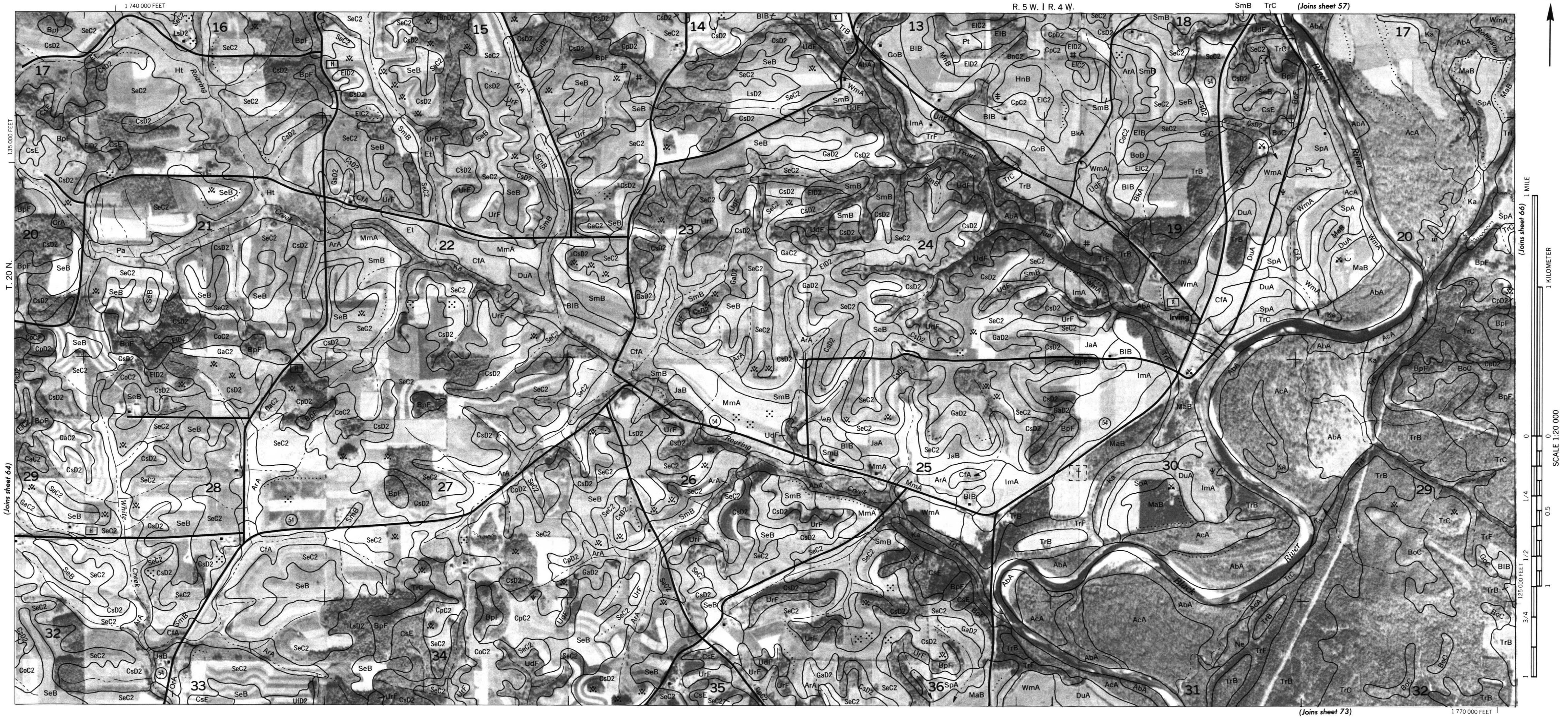
1 MILE

1 KILOMETER

0 1/4 1/2 3/4 1

0 0.5 1

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey from 1976-1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey from 1976-1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL SURVEY OF JACKSON COUNTY, WISCONSIN — SHEET NUMBER 66

N

R. 4 W. | R. 3 W.

1 MILE

1 KILOMETER

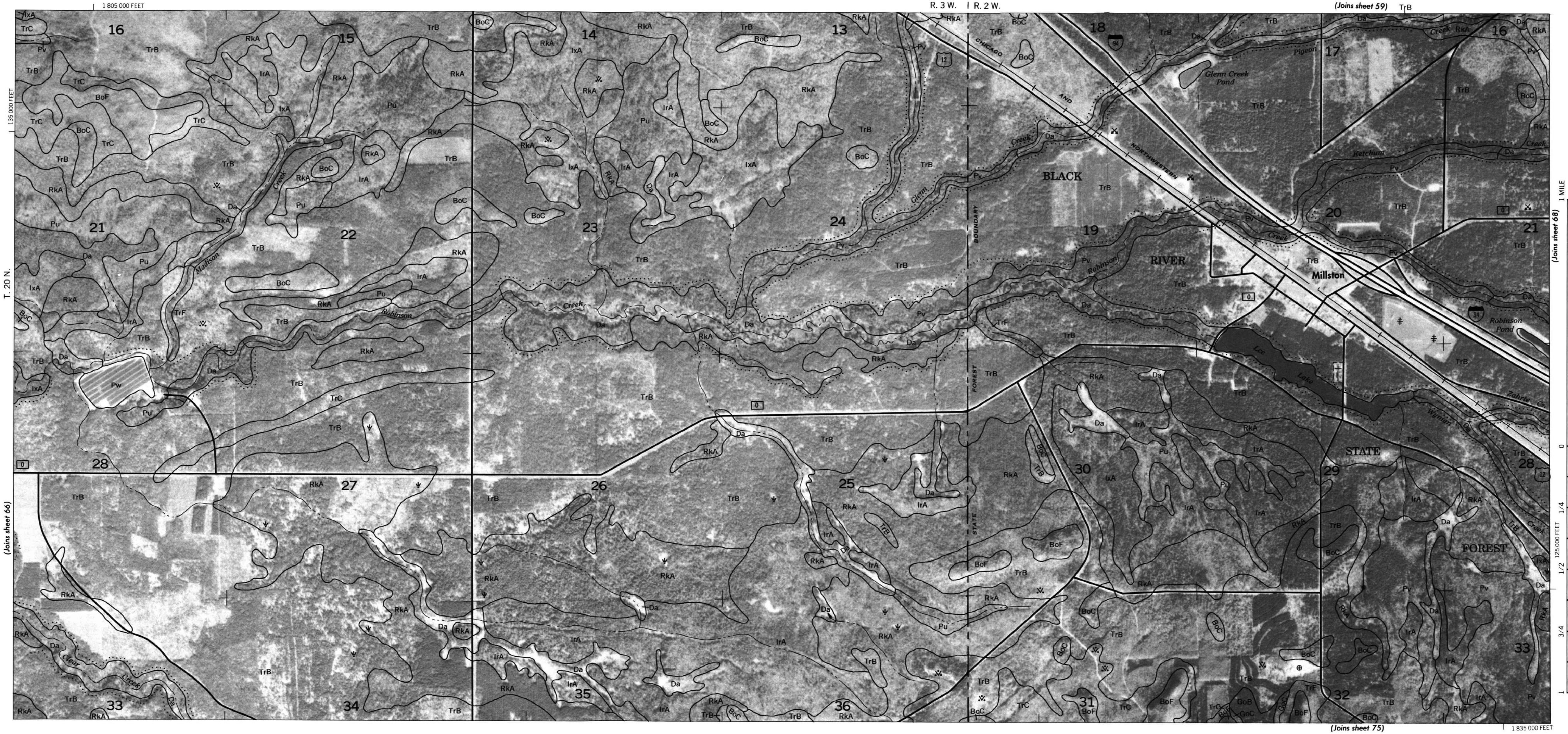
SCALE 1:20 000

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey from 1976-1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

67

N

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey from 1976-1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



1 MILE
1 KILOMETER
0
1/4
1/2
3/4
1
0.5
SCALE 1:20 000

68

N

(Joins sheet 60)

R. 2 W. | R. 1 W.

1 865 000 FEET

135 000 FEET

T. 20 N.

(Joins sheet 69)

(Joins sheet 67)

1 MILE

1 KILOMETER

SCALE 1:20 000

0 1/4 1/2 3/4 1

0 0.5 1

125 000 FEET

(Joins sheet 76)

1 840 000 FEET

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey from 1976-1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey from 1976-1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

R. 1 W. | R. 1 E.

1 870 000 FEET

(Joins sheet 61)

135 000 FEET

T. 20 N.

(Joins sheet 68)

(Joins sheet 70)

(Joins sheet 77)

125 000 FEET

1 900 000 FEET

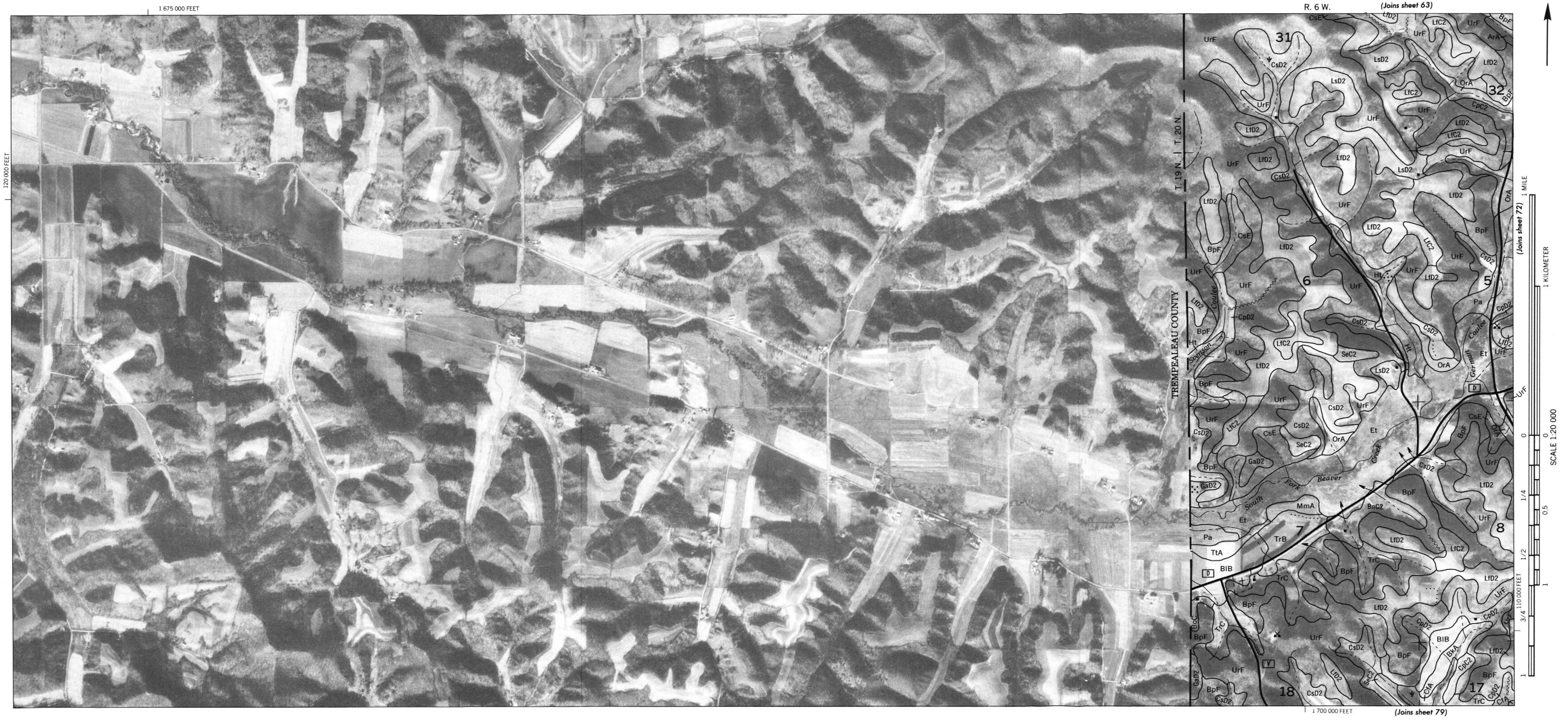
N

SCALE 1:20 000

0 1/4 1/2 3/4 1 MILE

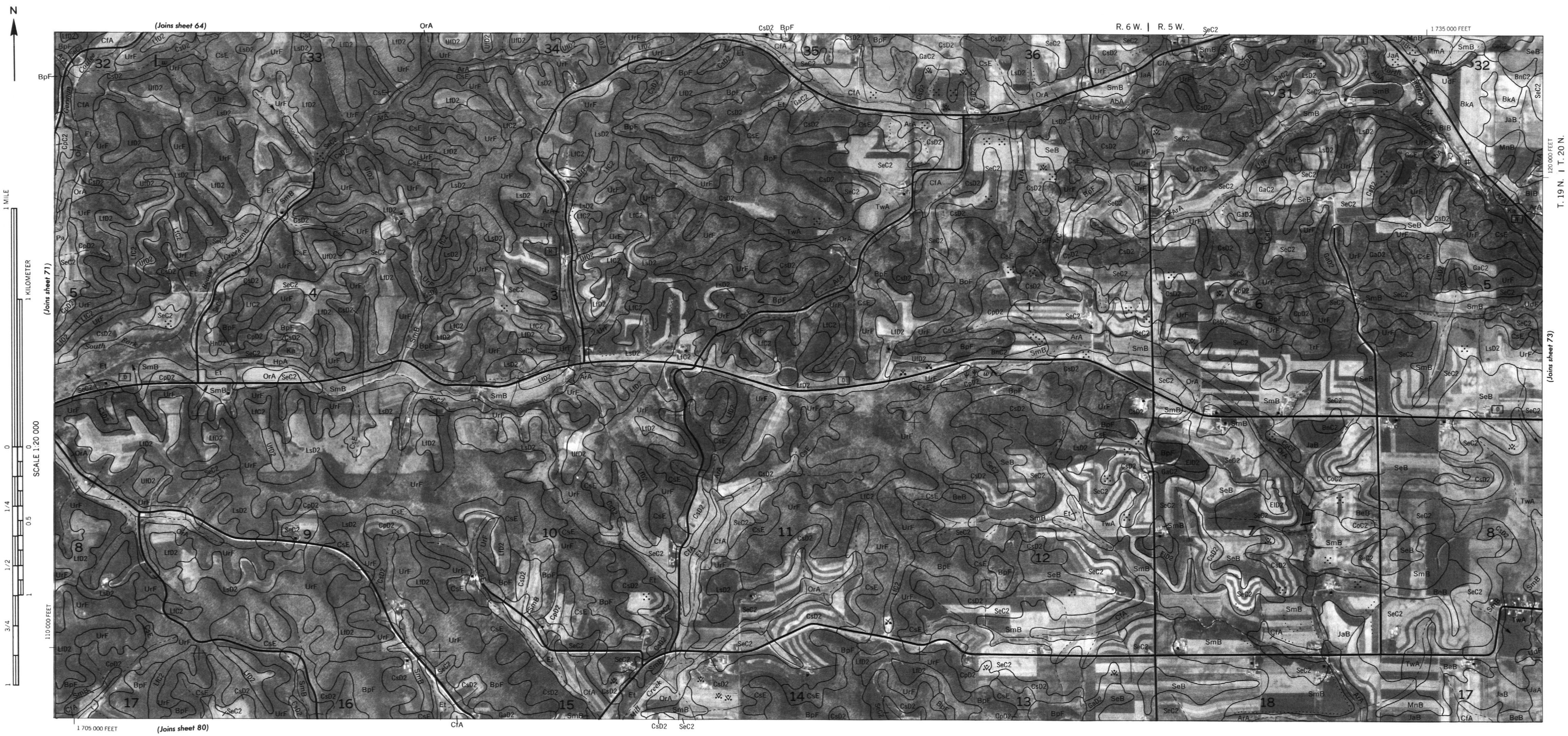
0 0.5 1 KILOMETER

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey from 1976-1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey from 1976-1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL SURVEY OF JACKSON COUNTY, WISCONSIN — SHEET NUMBER 72



This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey from 1976-1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

1 740 000 FEET

R. 5 W. | R. 4 W.

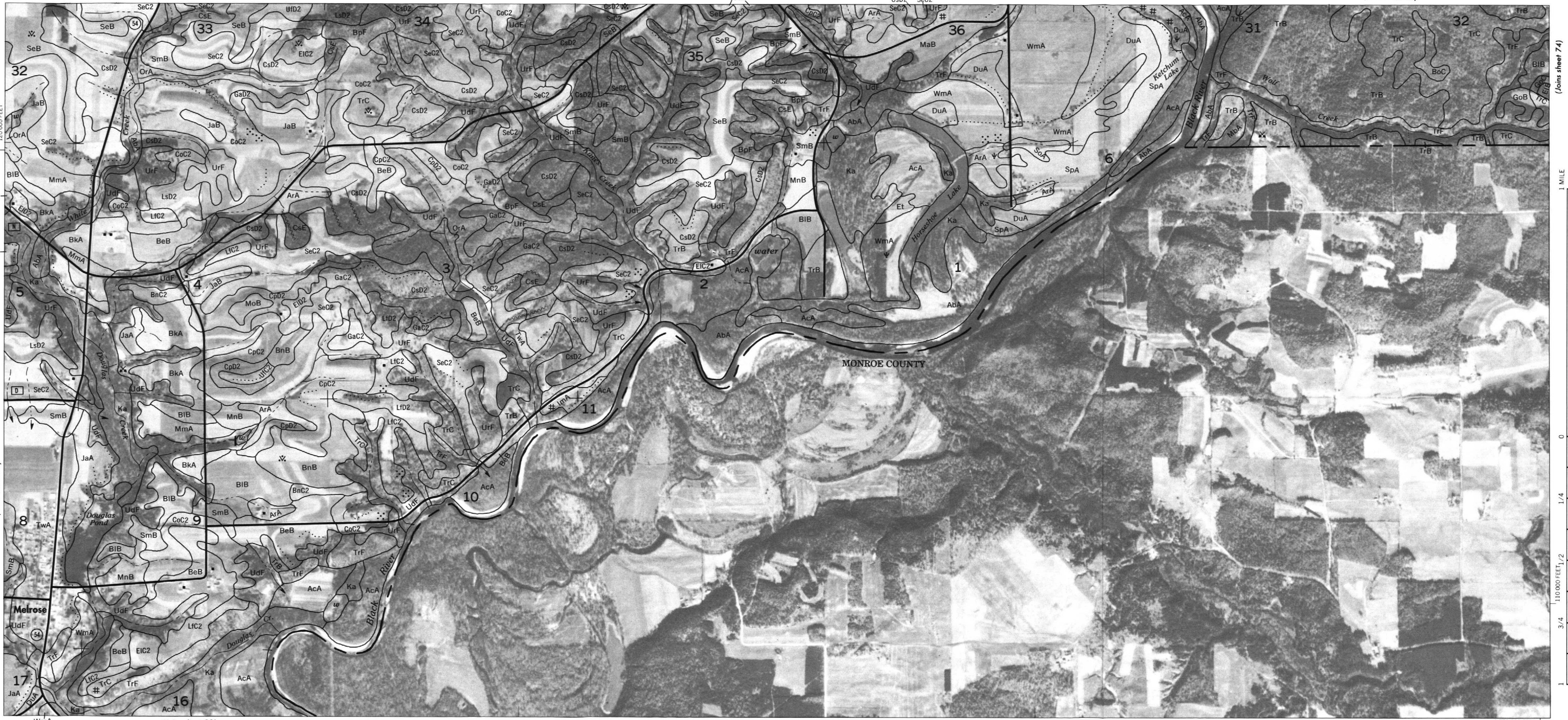
(Joins sheet 65)

T. 19 N. | T. 20 N.

120 000 FEET

(Joins sheet 72)

(Joins sheet 74)



(Joins sheet 81)

1 770 000 FEET

1 MILE

1 KILOMETER

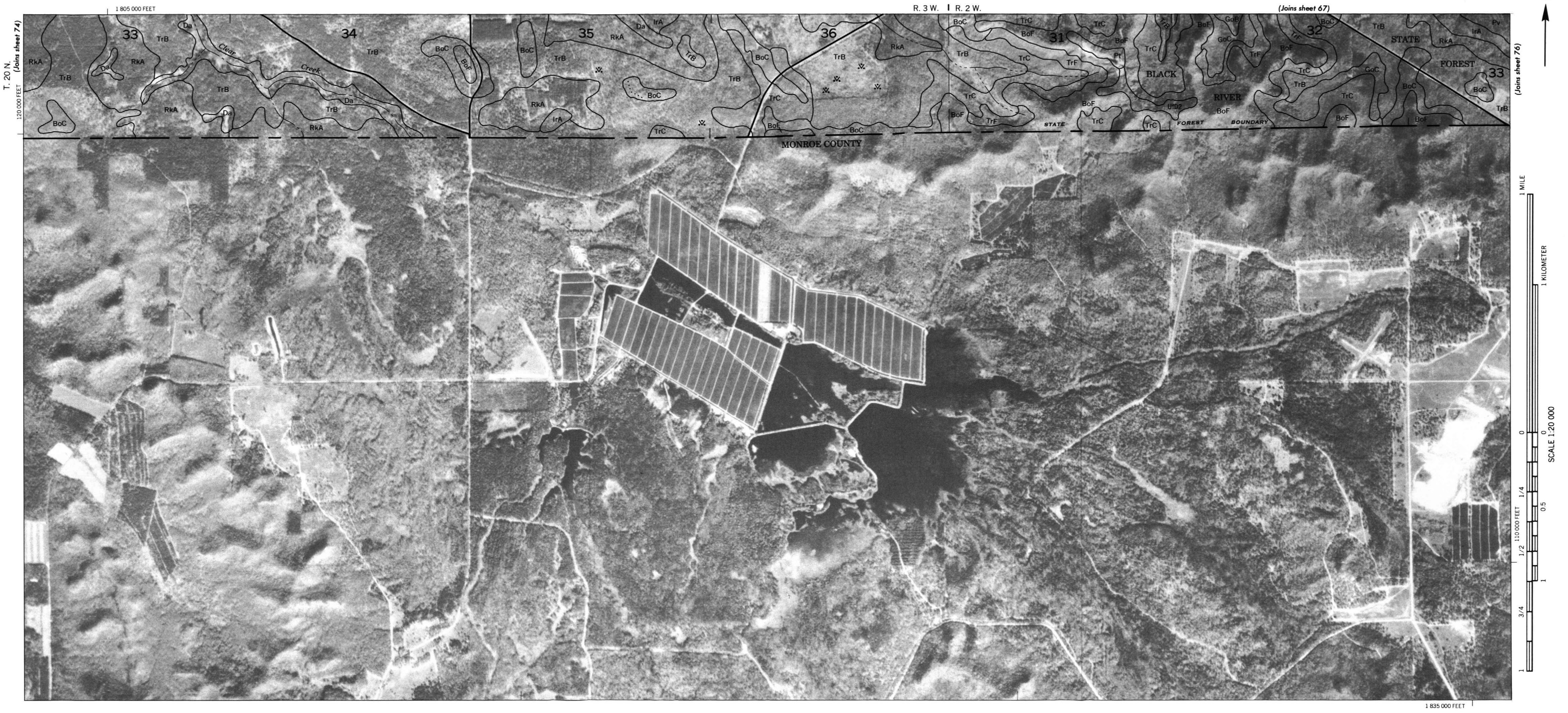
SCALE 1:20 000

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey from 1976-1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

(74)

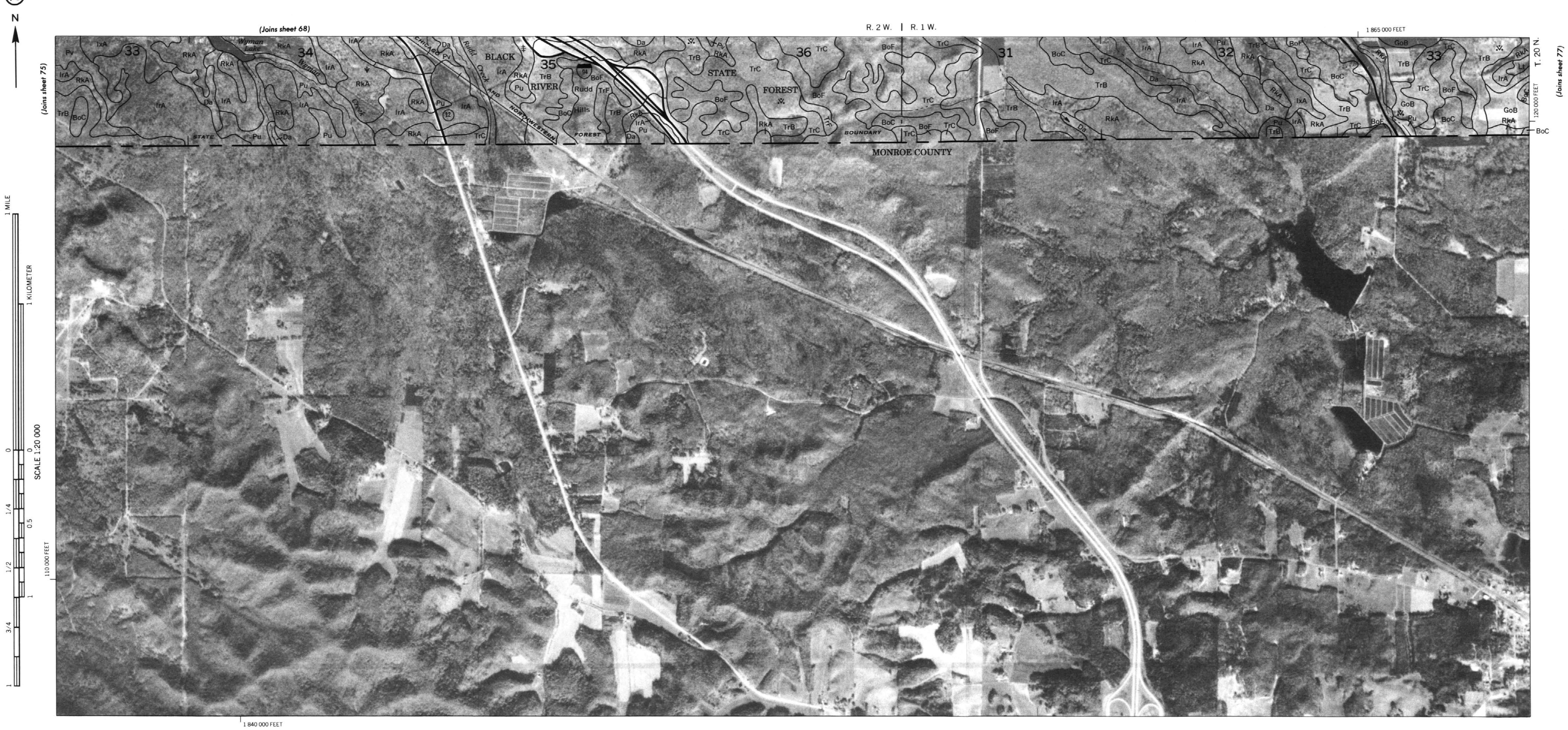
SOIL SURVEY OF JACKSON COUNTY, WISCONSIN — SHEET NUMBER 74

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey from 1976-1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey from 1976-1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

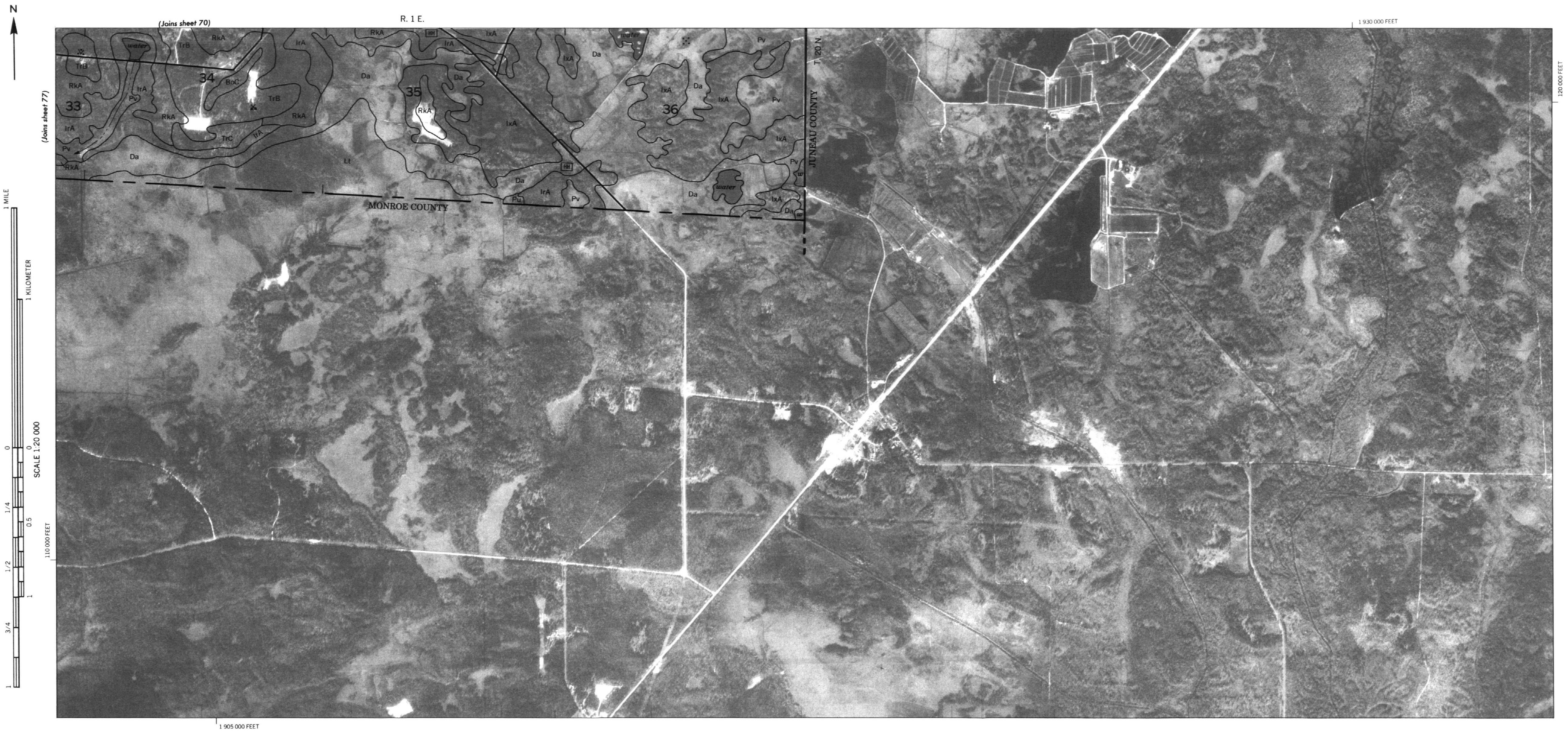
SOIL SURVEY OF JACKSON COUNTY, WISCONSIN — SHEET NUMBER 76



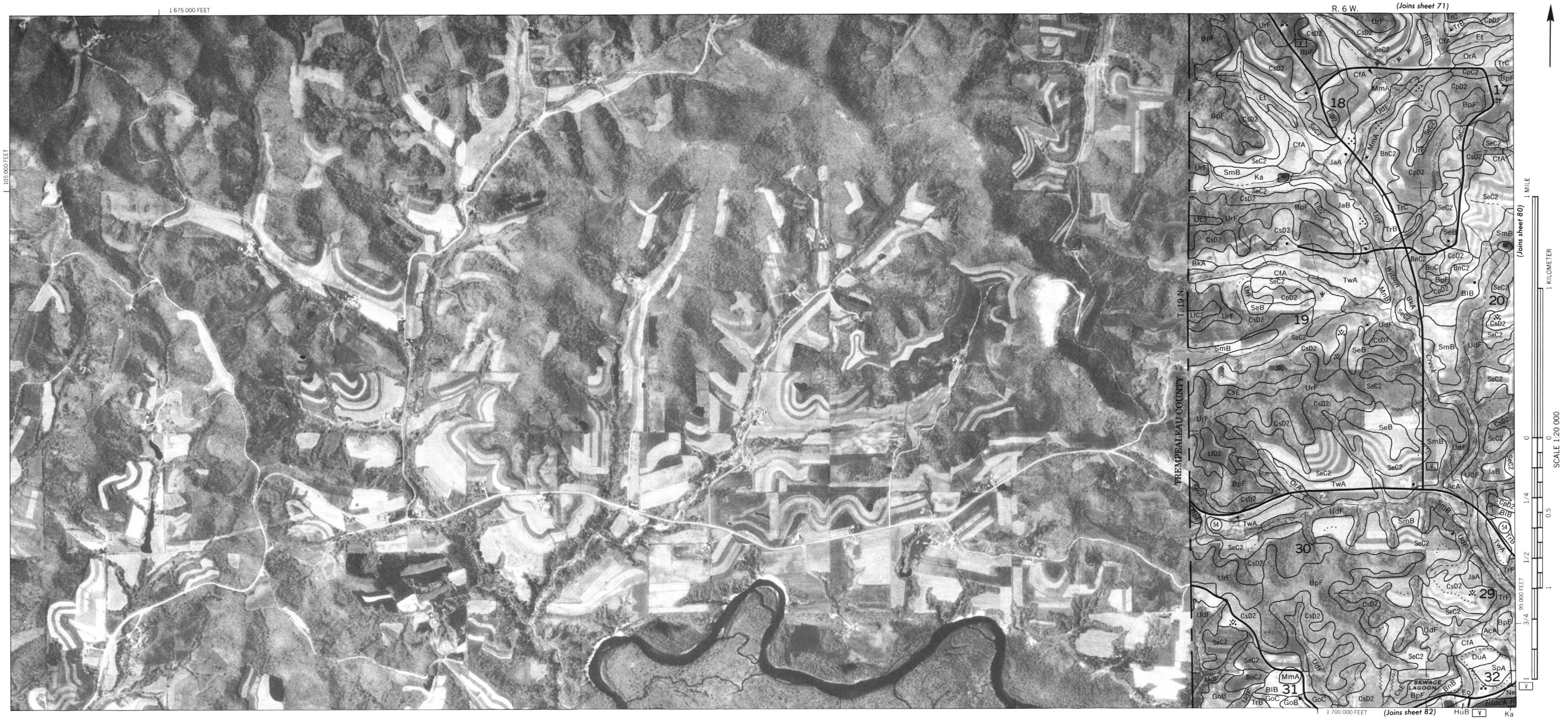
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey from 1976-1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey from 1976-1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL SURVEY OF JACKSON COUNTY, WISCONSIN — SHEET NUMBER 78



This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey from 1976-1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey from 1976-1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N

(Joins sheet 72)

R. 6 W. | R. 5 W.

1 735 000 FEET

(Joins sheet 79)

(Joins sheet 81)

T 19 N.

105 000 FEET

95 000 FEET

1 705 000 FEET

(Joins sheet 83)

1 MILE

1 KILOMETER

SCALE 1:20 000

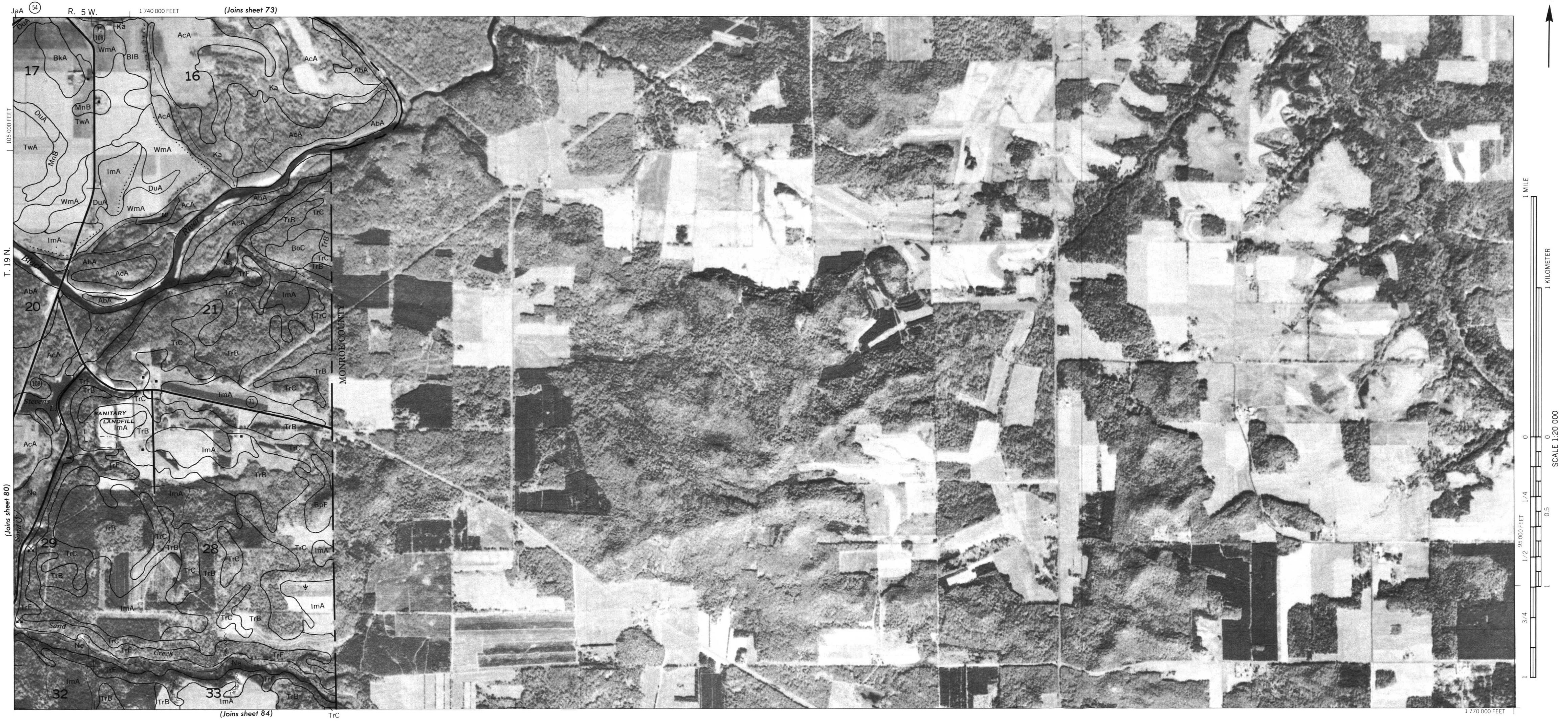
0 1/4 1/2 3/4 1

0 0.5 1

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey from 1976-1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

81

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey from 1976-1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey from 1976-1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey from 1976-1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SOIL SURVEY OF JACKSON COUNTY, WISCONSIN — SHEET NUMBER 84

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Interior, Geological Survey from 1976-1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.